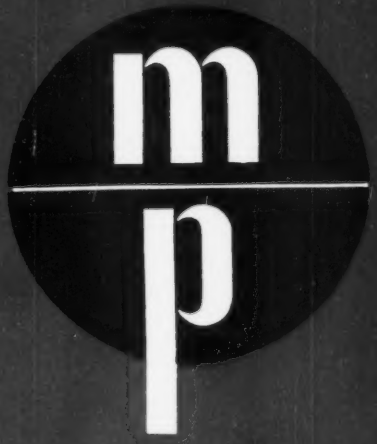
MODERN PLASTICS



JUNE 1950

It pays to use your custom molder's know-how

Results for camera maker: "Luxury" model at volume-market price

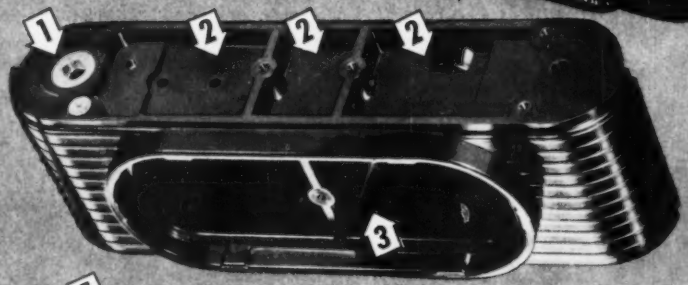
No. 18 in a series on Plastics Skill at Work...

PROJECT
Two-part body for 3-dimensional camera

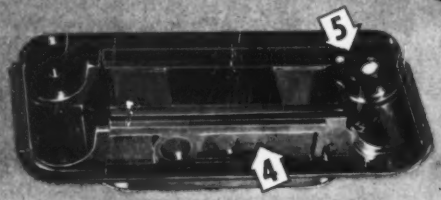
CUSTOMER
Stereocrafters, Inc., Milwaukee

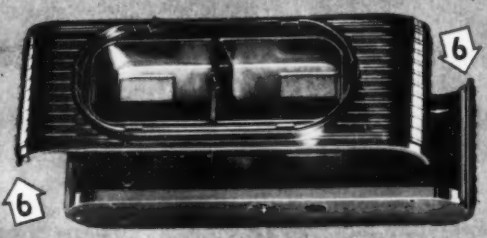
MOLDER
Dickten & Masch Mfg. Co.

MATERIAL
Medium-impact, high-finish Durez phenolic plastic



FRONT, TOP and half of both ends of camera body are molded in one piece. Cured plastic holds molded-in metal inserts in position (1). Numerous recesses (2) are produced with removable mold sections. Material has natural lustrous finish; dull finished inside walls (3) produce non-reflecting surface.





OPPOSITE VIEW reveals bosses and additional recesses in a variety of shapes (4) produced in the molding process. These aid in simple, fast camera assembly. Ribs (5) at both ends hold film spools in position and permit easy winding. Back half of camera is produced in same mold. Light traps (6) on which camera opens and closes have square-cut edges typical of this entire job.

Quite often, you must take something apart to realize how important a custom molder has been in lowering its cost or improving its performance.

Not so with this brand-new Videon Camera. It is priced in a bracket that will open up the hobby of 3-dimensional picture-making to thousands of eager customers. The key to this fact is a sleek black plastic body, which cuts many dollars off the selling price.

Only the skill of accomplished molders could have effected the economy inherent in the molding process to the extent realized in this camera. The two piece body, plunger molded, had to conform to the close tolerances necessary in a good camera. With intricate undercuts, through-holes, functional ribs, and molded-in metal inserts to be provided, the problem was solved with a mold having removable inserts.

This molding "know-how" pays the manufacturer in a number of ways. In much-reduced cost of delivered parts. In assembly time saved. In a lower selling price, a broader market, and a high degree of user satisfaction.

Close examination in practically any field of production will show you instances of this pay-off that custom molders offer. Their knowledge of mold design and mold-making — and of the flow and service properties of Durez phenolics — should have a place in your plans.

Call freely on your molder in solving your problems. Use the special knowledge of your Durez technician too.

A bit with plastics users everywhere is the handy "Durez Chuck-Chart." Write for yours. Durez Plastics & Chemicals, Inc., 126 Walck Rd., N. Tonawanda, N. Y.

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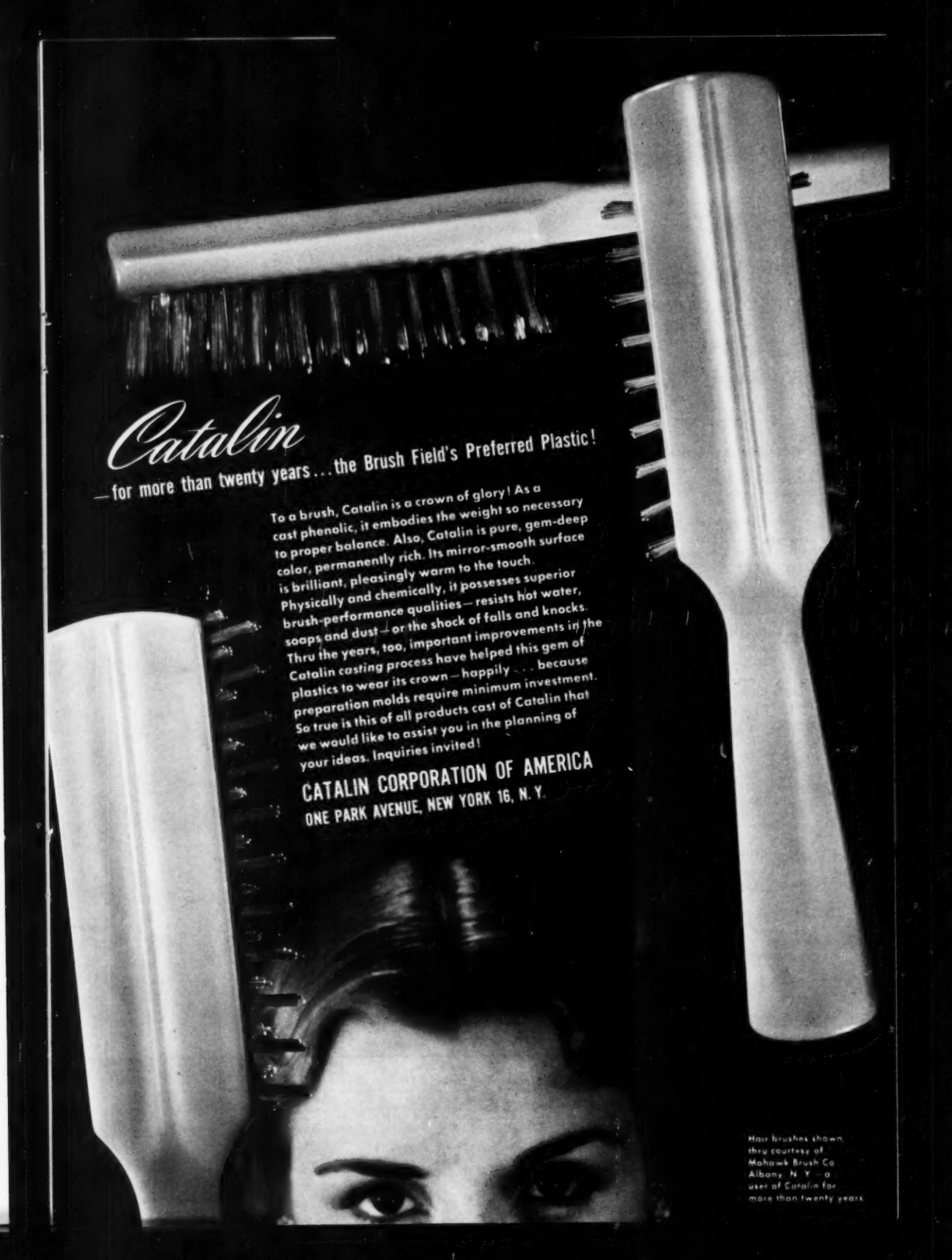
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Hair brushes shown thru courtesy of Mohawk Brush Co. Albany, N. Y.—a user of Catalin for more than twenty years

MODERN PLASTICS*

VOLUME 27 JUNE 1950 NUMBER 10

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PUBLICATION OFFICE: Orange, Conn. Executive and Editorial Office: 122 E. 42nd St., New York 17, N. Y. Published each month by Modern Plastics, Inc. Entered as second class matter at the Post Office at Orange, Conn., under the act of March 3, 1879.

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Subscription $5.00 a year, $8.00 for two years in the U.S., its possessions, and South America. Canadian subscription $5.00 a year, $8.00 for two years. All other countries $5.00 a year, $8.00 for two years, payable in U. S. currency. Price of this issue 75 cents per copy. Printed in the U. S. A. by The Wilson H. Lee Co., Orange, Connecticut.

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EDITORIAL

What Was Significant at the N.P.E.?

THERE are always with us those who, having followed from day to day every development in resins, processes, and equipment, complain that there was "nothing new" at the Fourth National Plastics Exposition. Perhaps these perennial deprecators want material makers, machinery builders, molders, and fabricators to save up their new offerings during a two-year period just to make a big splash and brighten the eyes of the blasé at the show.

Naturally there wasn't as much "new" at this show as there was at the previous shows. But there was more that was significant to our times—competitive times when better products and better values are demanded. Here is what we saw that we believe to be significant:

1) The huge number of applications in which plastics are taken for granted. Housewares, packages, toys, refrigerator parts, drapes, signs, upholstery, table tops, tableware, radio and now television cabinets have joined buttons, cameras, closures, telephones, and electric iron handles as fully accepted, expected, and recognized applications for plastics.

2) The many "before-and-after" proofs of the value of using plastics to improve products, lower costs, and increase sales. Not only did the S.P.I.-sponsored educational exhibit of one hundred case histories show this, but in several exhibitors' booths the same theme was hammered home.

3) The adult sureness of the industry's public relations as expressed by the exhibits. We no longer whisper of miracles or shudder at the thought of misapplications. We know what we're doing and can prove it. Our industry's engineering is second to none. Now our merchandising is growing up fast. We're not arrogant: just sure of ourselves.

4) The increasing possibilities in large molded pieces. When two 40-lb. television cabinets can be molded at one time on one press and when 5-lb. thermoplastic moldings are no longer rated "big," our market horizons are obviously widened manifold.

5) The international interest in the show and the tone of that interest. American molds are making products and parts in a score of lands abroad; American machines are operating in plastics plants around the world; American plastics materials are used everywhere except behind the Iron Curtain. Now we find foreign know-how, research results, and foreign machinery developments being offered to the industry here and furthered by American production ingenuity.

6) The new emphasis on industrial resins, discussed in our editorial last month, and the re-emphasis on industrial applications of molded, extruded, and laminated parts. Motors get smaller as high heat-resistant plastics come into more common use; multi-part machinery such as is used in textile making gets speedier as plastic bearings and other items become standard; chemical plants become safer and electronic devices more compact as their use of plastics increases.

It was a good show. (See page 74). It was attended by over 14,000 people who meant business. Exhibitors report great interest in their showings.

But there wasn't much "new" at the show. If MODERN PLASTICS and other industrial magazines continue to do a good job, there will be not much "new" at the Fifth N.P.E.—there'll be plenty that will be significant!

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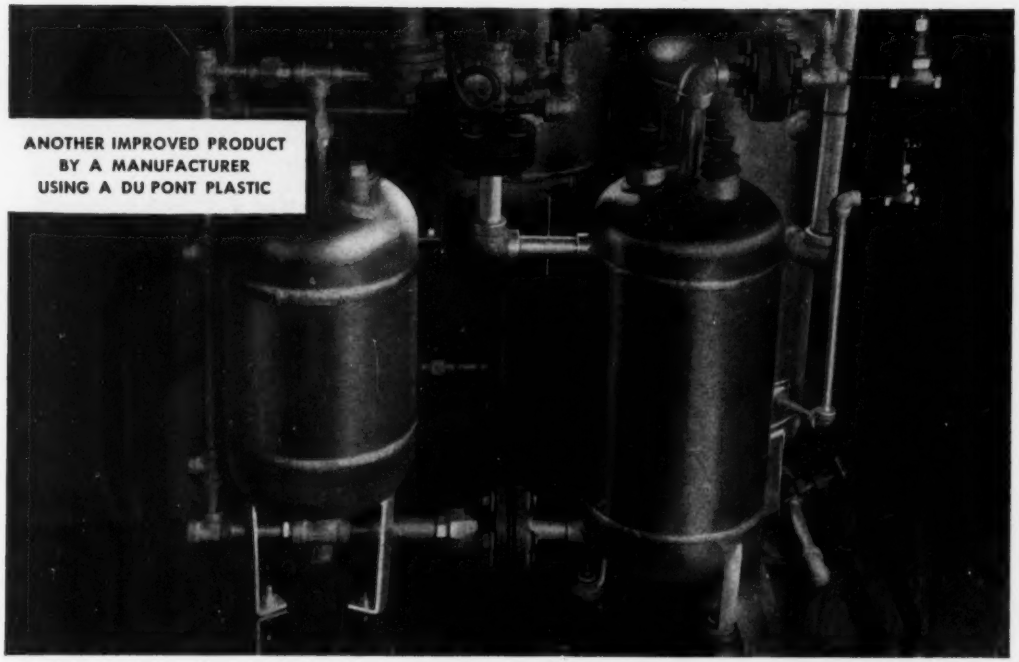
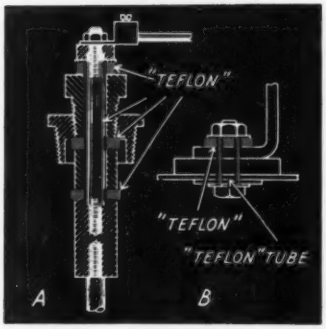


MOISTURE-PROOF "TEFLON"* AT DANGER-POINTS KEEPS STEAM FROM "SHORTING" GENERATOR

With high dielectric strength, heat-resistance, zero water-absorption, only Du Pont "Teflon" prevents electrical failures in portable steam generator

THIS manufacturer set out to design an electrically operated portable steam generator, for such uses as steam-jet cleaning, steam source for plastics-molding equipment, sterilizing of food equipment, and temporary steam source in industrial plants. A key problem was the prevention of electrical breakdowns under the unique conditions of the apparatus. It was necessary to (1) insulate electrodes going into the generator tank, and (2) isolate the generator tank from all other parts of the equipment. A material was needed that was completely moisture-proof, that would have high dielectric strength and provide a steam seal under high temperatures and pressures (up to 500 lb./sq. in.). Of all materials tested, only Du Pont "Teflon" tetrafluoroethylene resin succeeded.



(A) **"TEFLON"** in electrode housing provides high dielectric strength and high-temperature, high-pressure steam-seal.
(B) Insulation of "Teflon" on insulating flanges—one of key points where "Teflon" is used to insulate and isolate steam-generator tank from other parts.

"Teflon" was installed as electrode housings and gaskets, and at every point where the generator tank contacted regulator tanks or other parts. It provides high dielectric strength, zero water-absorption, heat resistance (up to 500°F.), and strength in compression. Thus a complete steam-seal is accomplished, and electrical failures are eliminated.

In addition, "Teflon" has outstanding electrical characteristics at high frequencies, and remarkable chemical inertness. Can your product use "Teflon"? It's supplied by Du Pont in standard shapes (rods, tubes, sheets and tape). Or we will recommend molders or fabricators who can supply finished parts of "Teflon." Write today for more information. Our technical staff will be glad to help you. E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Plastics Sales Offices: 350 Fifth Ave., New York 1, N. Y.; 7 S. Dearborn St., Chicago 3, Ill.; 845 E. 60th St., Los Angeles, Calif.

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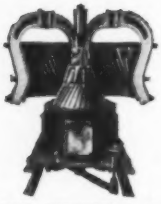

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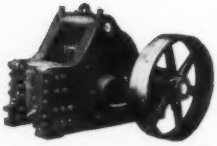

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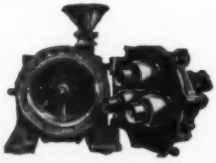

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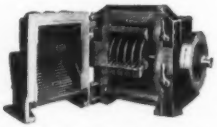

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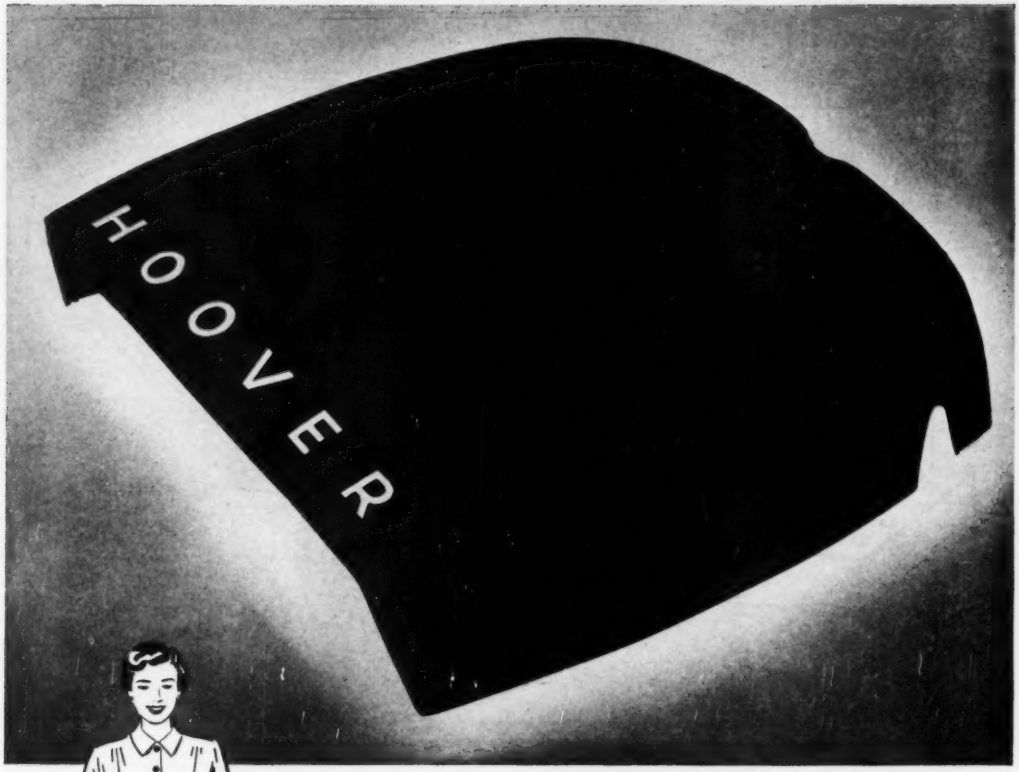

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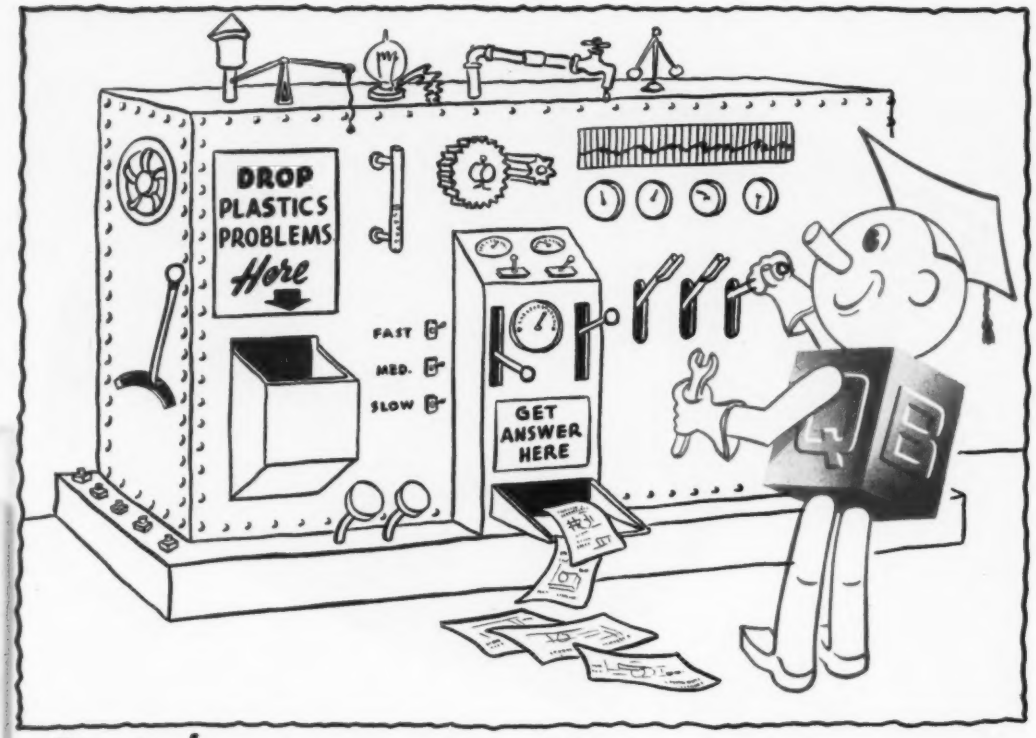

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Hershey Bar Bank housings being removed from an 8 oz. "Reed" at Felsenthal plant

★ There's no chance of loss in operating the novel Hershey Bar Bank molded of Lustrex polystyrene by G. Felsenthal & Sons of Chicago. This miniature vending machine for children guarantees them a 5¢ profit each time it is emptied.

Likewise, there's no chance of loss in operating Reed-Prentice injection molding machines. The Felsenthal Company relies on four of their 7 Reed-Prentice machines for uninterrupted, profit-making production of 6000 Hershey Bar Banks daily.

Available in 2, 4, 8, 10, 12, 16, 24, 32 and 60 oz. capacities, Reed-Prentice injection machines are noted the world over for their round-the-clock production records and economical maintenance.

WRITE DEPT. D for illustrated booklet— "A Complete Service on Injection Molding"

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

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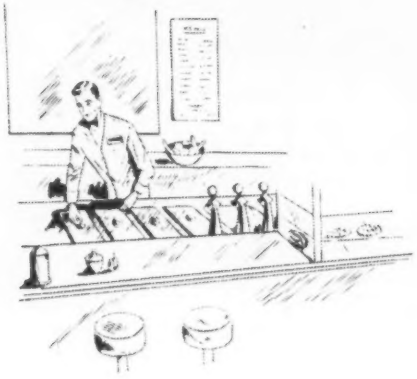
the "cream" of ice cream cabinet lids



Steiner Plastics chose Royalite as the ideal material from which to fabricate this colorful, insulated ice cream cabinet lid because it is light weight, highly impact resistant, easily cleaned, inexpensive and can be deep drawn.

Perhaps you have an idea for a product which calls for the characteristics of Royalite or for the properties of acrylic plastics? If so, Steiner Plastics, with more successful jobs to its credit than any other fabricator, is your most logical counselor. Steiner has fabricated hundreds of signs, transparent demonstrators, displays, industrial components and other items. The extensiveness of our know-how and facilities are your guarantee.

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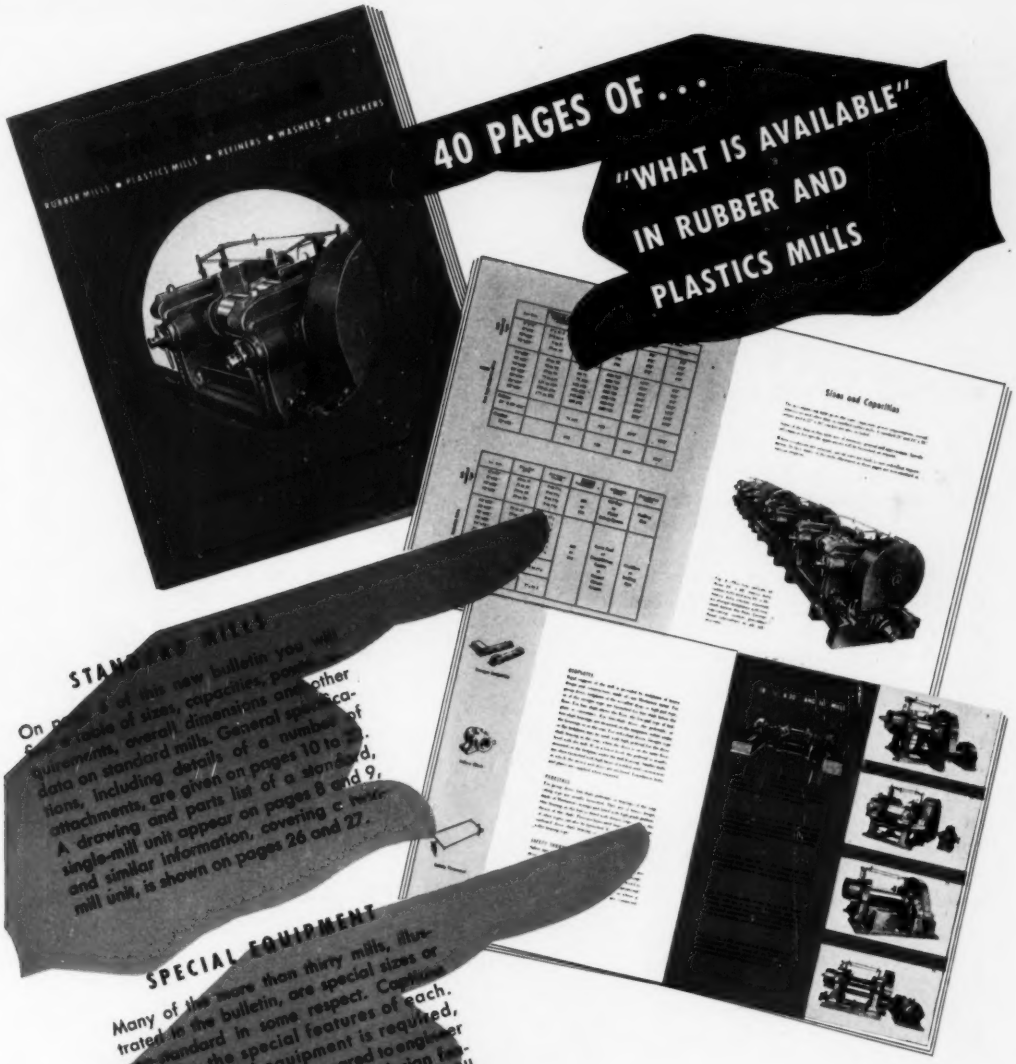
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Many of the more than thirty mills, illustrated in the bulletin, are special sizes or non-standard in some respect. Captions describe the special features of each. Where special equipment is required, Farrel-Birmingham is prepared to engineer mills with any combination of design features and attachments necessary to fill particular requirements. Ordinarily, any mill needed can be furnished from existing drawings and patterns because, in a century of building processing machinery, the company has designed mills for almost every conceivable application.
FB-586

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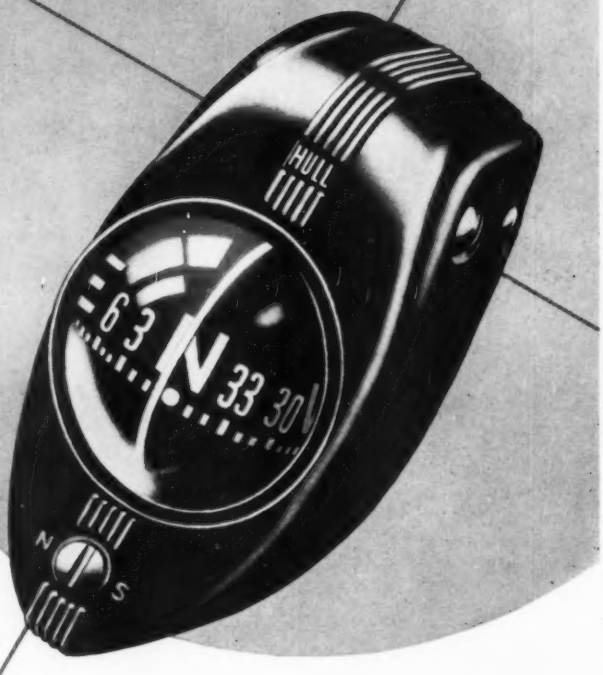

Long a favorite with motorists, the Hull automobile compass stands up under hot summer sun, sub-zero cold and constant vibration. Its attractive, streamlined housing is molded in durable phenolic by General Industries . . . has been ever since the compass was first introduced seventeen years ago.

In the record of these hundreds of thousands of compass housings molded for Hull Manufacturing Company, is another convincing demonstration of the long-term satisfaction that comes from doing business with GI —one of America's foremost custom molders of top-quality plastics.

Whatever the direction in which your product is heading—increased sales appeal, improved design or lower cost —you'll be on the right course when you bring your plastics molding requirements to General Industries. Extensive modern facilities for compression and injection molding, backed by 30 years of plastics molding "know how", are ready to go to work for you. Write, wire or phone *today*.

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From 2... to 200 oz.

...and, all are obtainable from one source of supply—Watson-Stillman.

Since the very inception of the industry over 50 years ago, Watson-Stillman engineering ingenuity has paced the industry, year after year, with outstanding plastics molding machinery advancements.

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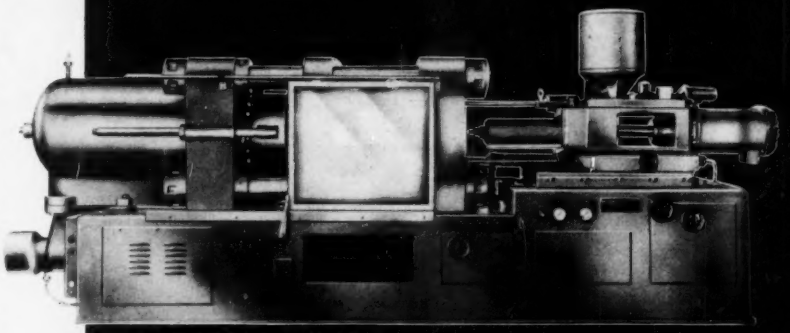
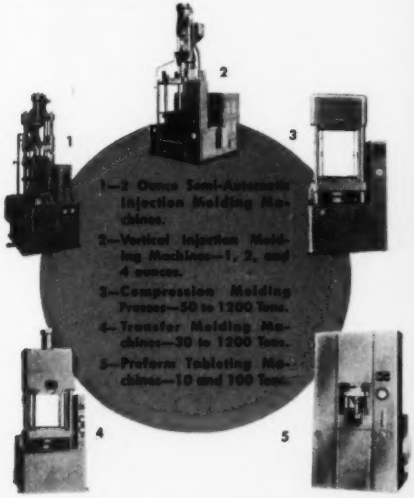
And, W-S offers many additional services. Mold designs, material selection, operation, maintenance, plant layout, are all subjects about which W-S is in a particularly good position to give advice to its clients as a part of its "COMPLETELINE" service.

When planning plant extension or a new business, consult W-S *first* about plastics machinery and how to use it.



Horizontal Injection Molding Machines—8 to 120 Ounces



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P-K-13A

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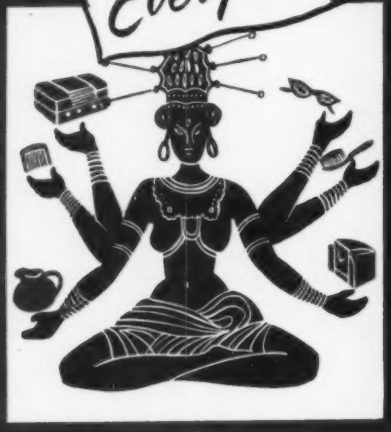
Memo
to alert molders Everywhere!



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Gering Metallic Mother-of-Pearl and Silver-Flake Tinsel are good news to all progressive molders. By making them available in a wider range of scintillating colors and applications, Gering further widens plastics-goods markets. Alert molders will look into the new-product stimulus provided by these gem-like special effects... Furthermore, any molder who has molds of past sales-successes on his store-room shelves should consider the RENEWED market possibilities in rich-looking Mother-of-Pearl, sparkling Silver-Flake Tinsel and a fine gamut of Metallic colors. All these are Gering Laboratory triumphs.

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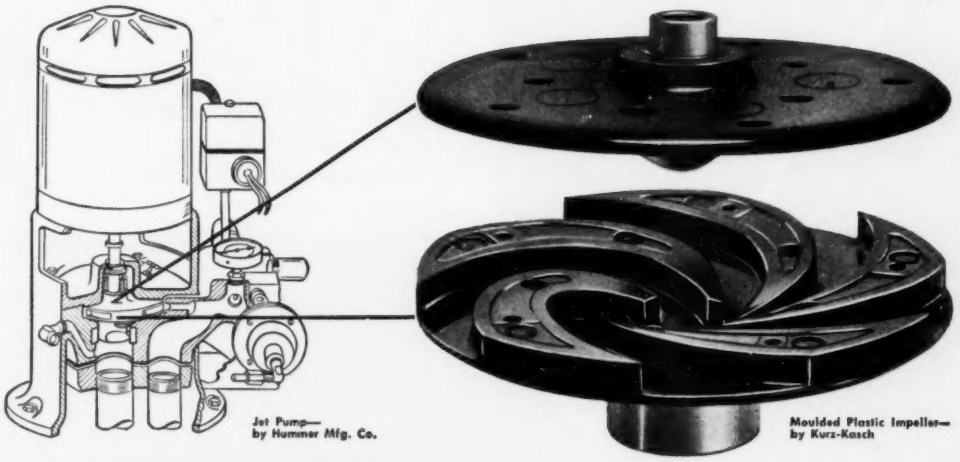
Constantly immersed in water—perfectly balanced for vibrationless high-speed performance—Kurz-Kasch moulded plastics take on a new pumping job with the same old, proved results: tip-top performance and low-down cost. Just ask Hummer Manufacturing Co., makers of an outstanding line of quality jet pumps.

It's their centrifugal impeller that you see here—the single moving part in one of the most efficient types of modern well pumps—actually, the heart of the entire mechanism. It used to be made of forged or sand-cast brass. Inasmuch as it revolves at 3500 RPM, finishing operations were extensive, including machining, hand-finishing of water passages, and balancing. Results were good generally, but expensive—so Hummer engineers decided to see if plastics would meet their exacting requirements.

This job does it, performance-wise and cost-wise both! It has passed 7 years of laboratory and field tests with colors flying! We recommended an improved high-impact phenolic, moisture-resistant with special resistance to alkalis and acids. We mould it in 2 pieces, with insert and bushing moulded in; cool it in a shrink fixture for a straight, tight, gapless fit. Finishing consists merely of flash removal, facing inserts and riveting.

Look at the difference in costs! Look at what Hummer engineers say about performance! Look—say, if you want a job done for you in plastics, just look our way! We answer inquiries promptly.

Here's a proven impeller in PLASTICS!



Jet Pump—
by Hummer Mfg. Co.

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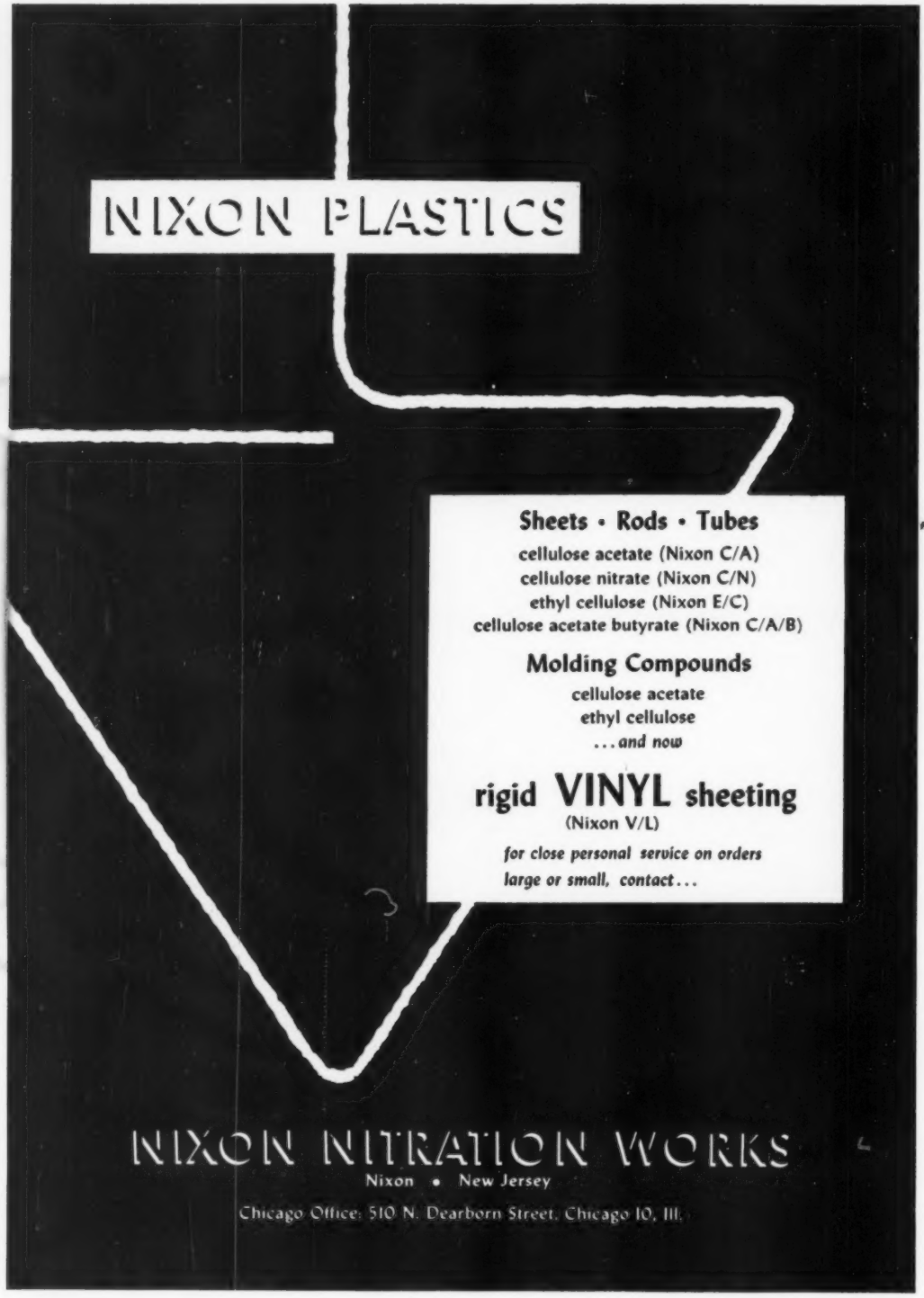
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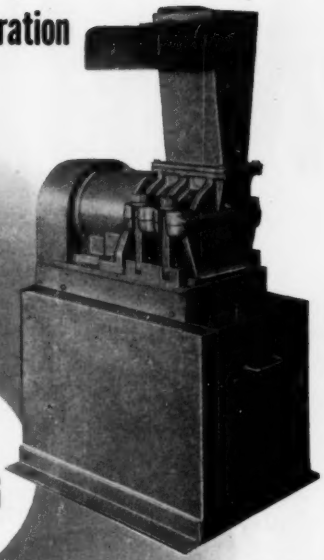
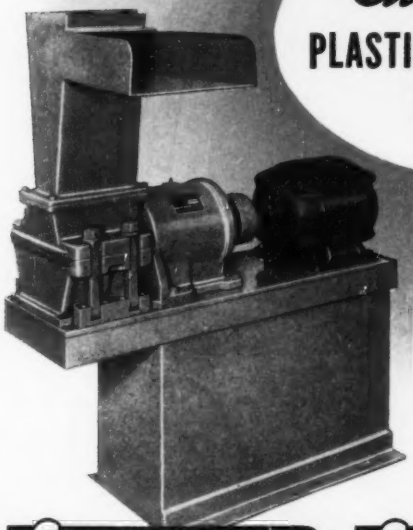


Cumberland PLASTICS GRANULATING MACHINES



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FOR CENTRAL GRINDING

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Saves handling costs. Prevents contamination of material. Occupies less floor space. Material container is built-in. Available in Models 0 and 1/2 only.

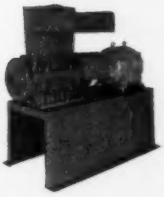
For complete information, request Bulletin 250.

CUMBERLAND

ROTARY CHOPPING MACHINE

Heavy duty, rugged machine. Used for cutting thick vinylite slabs from two roll mills. Also used as large capacity pelletizer. Other applications are described in Bulletin 400.

CUMBERLAND



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Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin 250.

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Smaller, companion model to Rotary Chopper. Designed specifically for use with continuous extruders. Request Bulletin 500.

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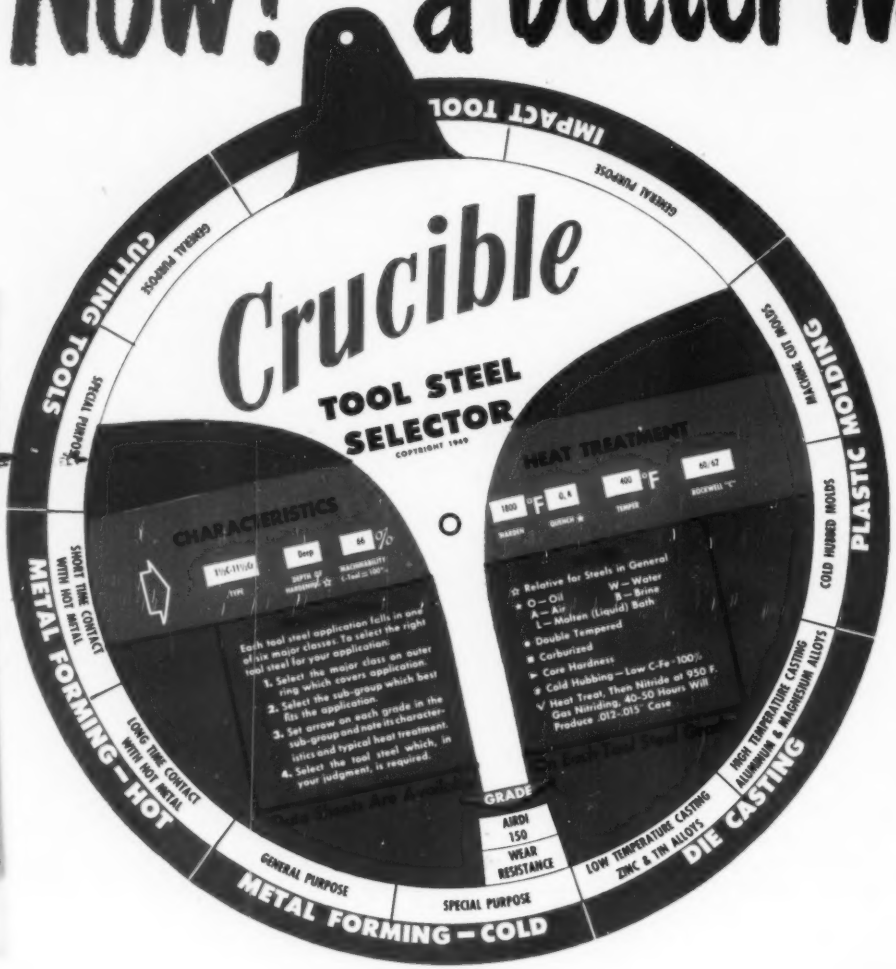

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS— and you've got the *right* answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!
And you're sure you're right!!

to select tool steels

Get the right answer instantly

The CRUCIBLE TOOL STEEL SELECTOR uses the only *logical* method to select the *right tool steel right from the start!* Your own experience tells you that the *application* should dictate the choice of the tool steel... and Crucible has applied 50 years of tool steel leadership to adapt this idea to the simplest, handiest instrument you've ever used—the Crucible Tool Steel Selector. Put an end to costly trial and error tool steel selection. When you're tooling up, a turn of the Selector gives you the *right answer*—instantly.

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Now you can start with the application, and the answer you get from the Selector will prove satisfactory in every case, for the Crucible Tool Steel Selector covers 22 Tool Steels which fit 98% of all Tool Steel applications. You no longer need to start with a steel of known characteristics and back your judgment with a costly trial experiment.

And here's an important production point! ALL the tool steels on the Crucible Tool Steel Selector are in warehouse stock . . . that means when you get the answer, you can get the steel . . . fast!

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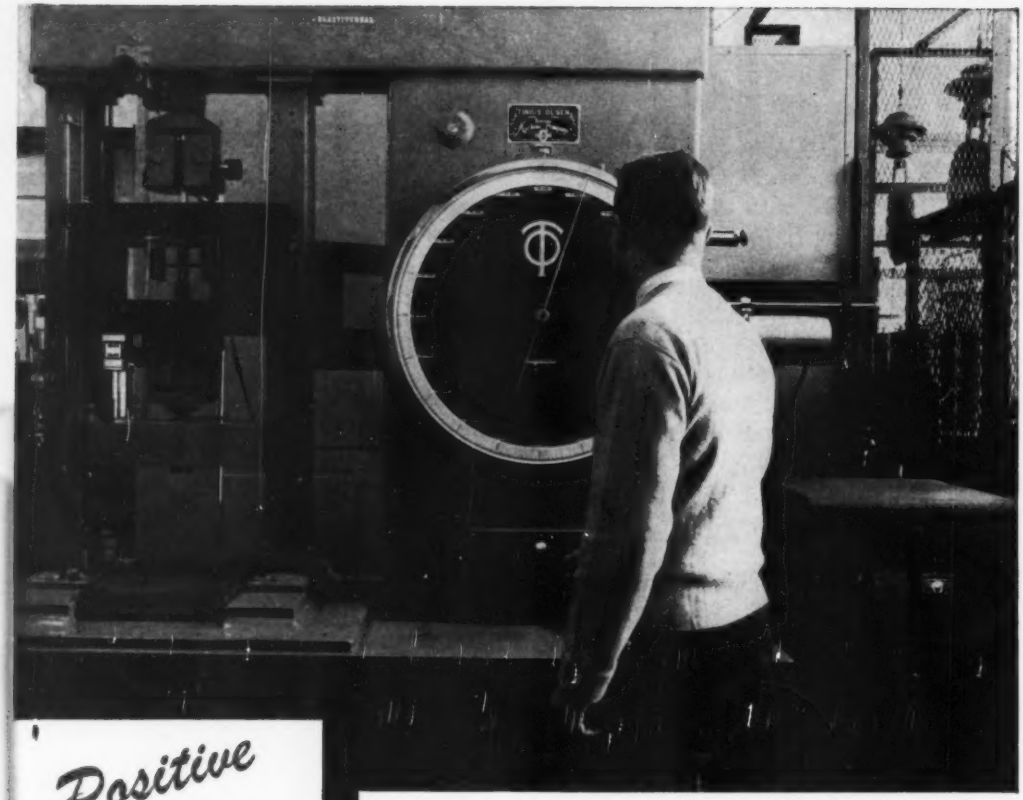

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with the

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The Olsen Plastiversal Testing Machine equipped with the Olsen High Magnification Recorder, produces in chart form, accurate stress-strain curves for each test run. The specimen may be placed in a temperature controlled cabinet and, whether testing for tension, compression or flexure, the Extensometer records each physical change for the complete range of temperatures.

For dependability, high accuracy and ease of operation the Olsen Plastiversal is an invaluable aid in the comparison, standardization, control and development of plastic materials.

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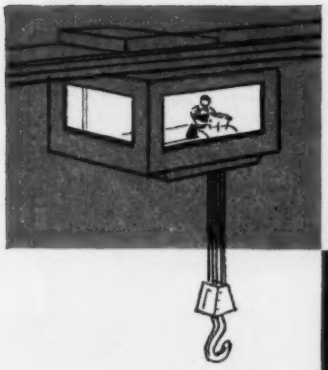
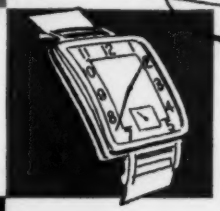
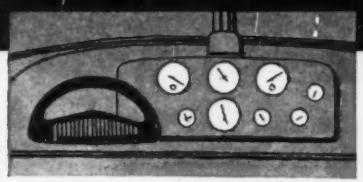




COLUMBIA MONOMER*

CR 39

ALLYL DIGLYCOL CARBONATE



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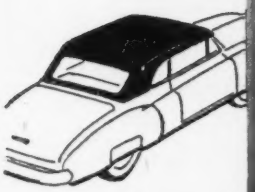
Columbia Monomer CR 39 is a clear, colorless, water insoluble organic liquid of low viscosity.

In cast sheet form, CR 39 presents marked advantages in aircraft and radio instrument panels, industrial crane enclosures, watch crystals, welders' helmets and safety goggles, rear lights for convertible tops . . . to mention only a few.

The desirable properties of CR 39 show unusual promise for this monomer in many other applications. If your present products, or planned products, call for such a material, we suggest you look into CR 39 immediately. Write for information. Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth at Bellefield, Pittsburgh 13, Pennsylvania.



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Columbia furnishes only the CR 39 liquid monomer. It can be obtained in cast sheets of various standard sizes, or to finished dimensions from:

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F84E *and* **XF91**

PLYON*

PLYON* fuel cell backing . . . the plastic backing for self sealing fuel cells, in accordance with AAF Spec. 12042, Type 2 . . . forms one of the indispensable safety factors in the superb performance of the F84E and XF91, produced by the Republic Aviation Corporation, Farmingdale, L. I., N. Y.

From the original great "Thunderjet" F84 to its latest improved version, the F84E, this product of Swedlow engineering has proved itself in actual service over a period of four years.

Based on this performance, it is again serving in Republic's new XF91, U. S. A. F.'s high altitude interceptor slated to achieve new peaks in fighter aircraft performance for its type.

Among other notable developments in which Swedlow PLYON had a share are the latest achievements of

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- CONSOLIDATED VULTEE AIRCRAFT CORP.
- DOUGLAS AIRCRAFT CO., INC.
- FAIRCHILD ENGINE & AIRPLANE CORP.
- LOCKHEED AIRCRAFT CORP.
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- NORTH AMERICAN AVIATION, INC.
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Swedlow PLASTICS CO.

We shall be glad to assign a staff engineer to work with you in solving problems in plastics connected with new developments in any industry.

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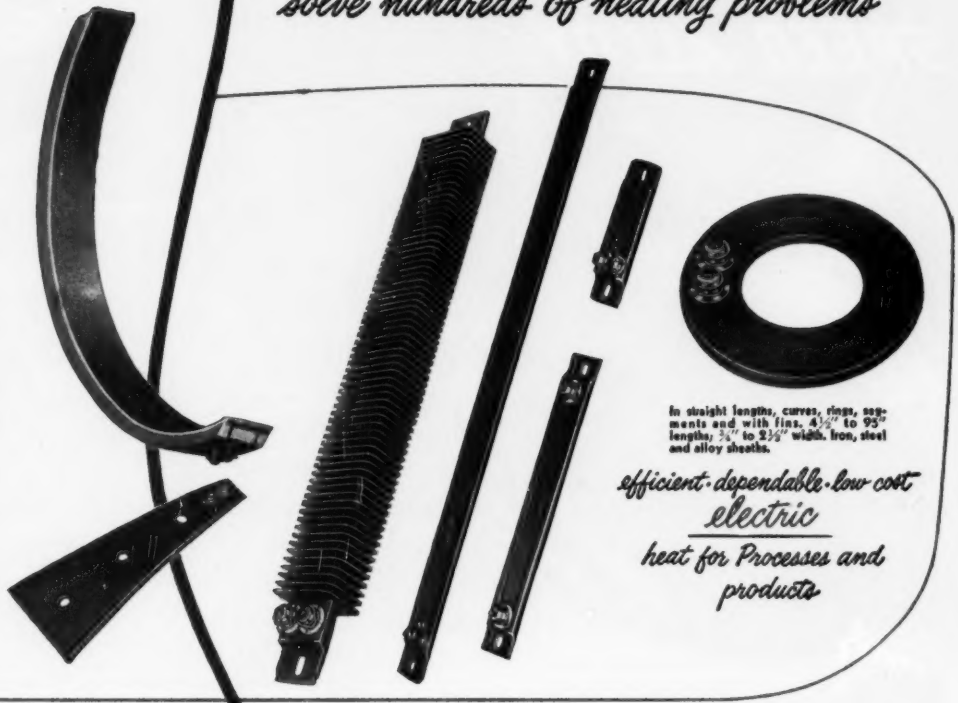
STRIP HEATERS
solve hundreds of heating problems



In straight lengths, curves, rings, segments and with fins. 4½" to 95" lengths; ¾" to 2½" width. Iron, steel and alloy sheaths.

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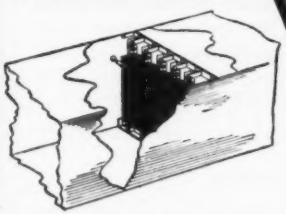
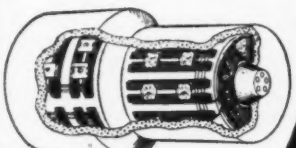
TYPICAL APPLICATIONS



Chromalox Electric Fin-Strip Heaters mounted in air ducts.



Plastic extrusion barrel with Chromalox Ring, Straight and Curved Strip Heaters.

IC-50

Easy to Install CHROMALOX Electric Strip Heaters give clean, dependable and accurately controlled heat. They are widely used in platens, dies, kettles, tanks, ovens, air ducts and other applications requiring accurate temperature control and around-the-clock service.

If you are a user of heat, either in processes or products, you can get many valuable application ideas by sending for the booklet below. On-the-job engineering assistance, without obligation.

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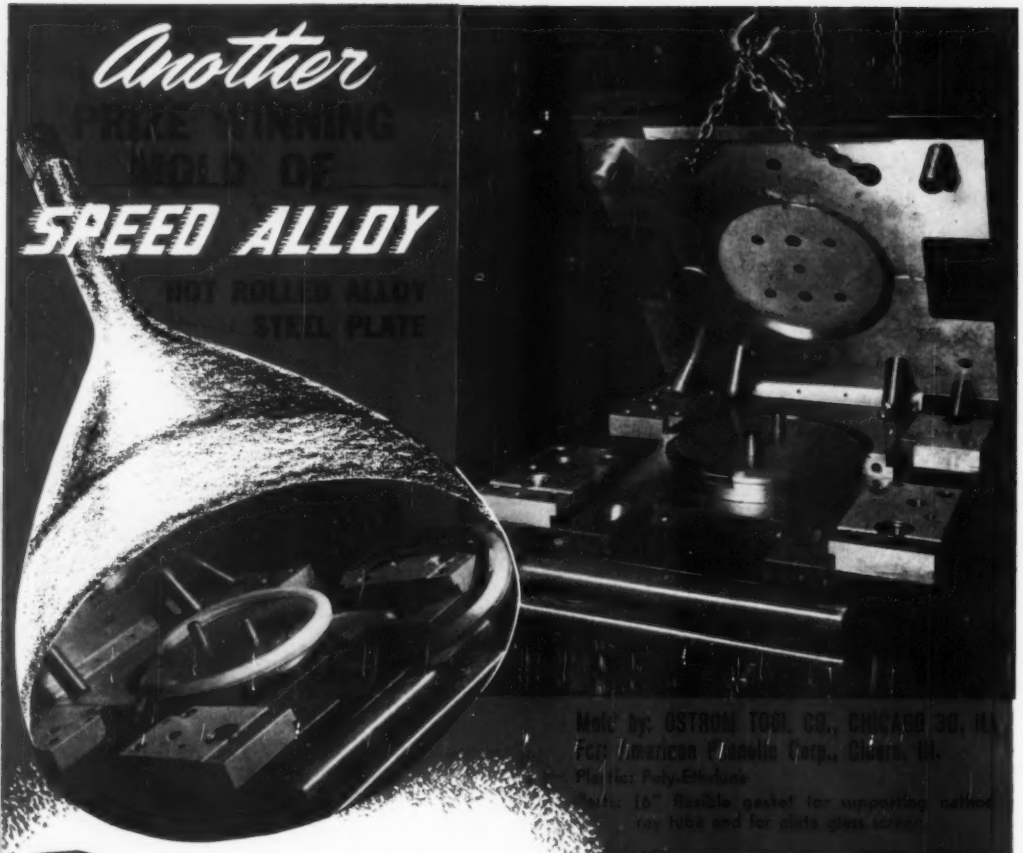
Send for this booklet of application ideas you can adapt for use in your plant. Write for your free copy today.

EDWIN L. WIEGAND COMPANY. 7503 THOMAS BLVD. · PITTSBURGH 8, PA

Another SPEED ALLOY



TOP OF MOLD was machined from 36" x 36" x 6" Speed Alloy Plate—bottom was 36" x 36" x 5½" thick. Plungers were also Speed Alloy. Mold was completed in 12% less time than if a comparable mold steel was used. Toolmaker reports unusually good finish as ground—very little polishing necessary. Mold was carburized and oil quenched to a Rockwell hardness of 55 C plus. Distortion was negligible. Polishing characteristics, after hardening, were excellent.

VIRTUALLY all mold making jobs call for speed and utmost economy—Speed Alloy is the answer—it bridges the gap between carbon and tool steels, and provides many economies, which in the instance of this particular mold effected a saving of over $1,000. This mold was made with interchangeable plungers for molding 16" flexible plastic gaskets for television tubes and screens. It is believed to be the largest fully automatic television ring mold made to date. Speed Alloy available in widths to 72", to 6" thick. Ask for bulletin 905.

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SPEED STEEL PLATE DIV.
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Plants: Hammond and Indianapolis, Indiana

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or

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DOWTHERM speeds the heating cycle and at the same time reduces labor costs. In addition to being used in forming operations DOWTHERM's ease of control and application assists in the mass production of nylon, and phenolic and alkyd resins.

Are *you* fully acquainted with DOWTHERM's higher operating efficiency? If your process requires temperatures between 300 and 750°F., we welcome the opportunity to discuss DOWTHERM with you. Write Dept. DM 17.

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DISSTON PLASTIKUT® . . . A "cut mold" steel, correctly alloyed for maximum core and case strength. High tensile (machining needed instead of hobbing). Longer lasting . . . pays out on long runs.

Whatever your mold and hob problems, ask for the expert aid of Disston metallurgists and engineers. Special Disston Folder tells how to judge mold and hob steels; what to look for and avoid. Gives you analyses and heat treatment data on Disston Mold and Hob Steels, plus other helpful information. Write for your copy.

Maryland Plastics, Inc., Federalsburg, Md., uses Disston Mold Steels in the production of charms and buttons.

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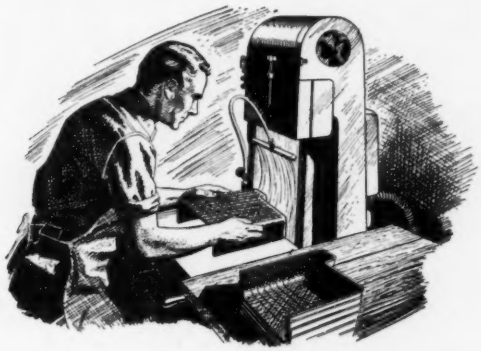
COATED PRODUCTS COMMENTS



Getting more belt value

Plastic molders are discovering that Waterproof Cloth Belts by CARBORUNDUM are particularly designed for plastic finishing. It is natural for a belt to deliver greater value, if it is specifically formulated for the wet sanding of plastics, and other ductile materials subject to plastic flow.

It is worth emphasizing again that among the characteristics of these belts are a hard and sharp silicon carbide abrasive, a resin bonding agent, and a resin pre-sized wear resistant cloth.

Scanning customer reports on their satisfaction with these Waterproof Cloth Belts by CARBORUNDUM reveals the importance attached to safer operation. One advantage, especially favored, is the elimination of "splice-throb" which can result in belt breakage and work spoilage. Another feature lies in the fact that when used with lubricants, these belts wet-down plastic dust, thus eliminating a recognized nuisance. Make it a point to talk over all the advantages with your CARBORUNDUM representative. Coated Products Division, The Carborundum Company, Niagara Falls, New York.

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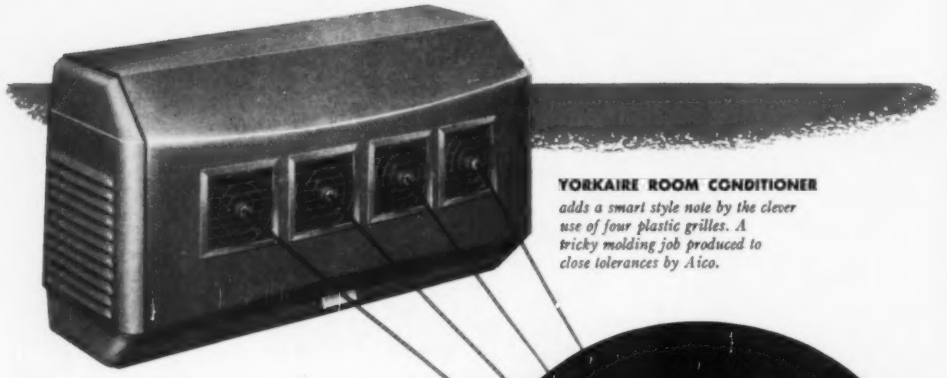
TRADE MARK

Making ALL abrasive products...
to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

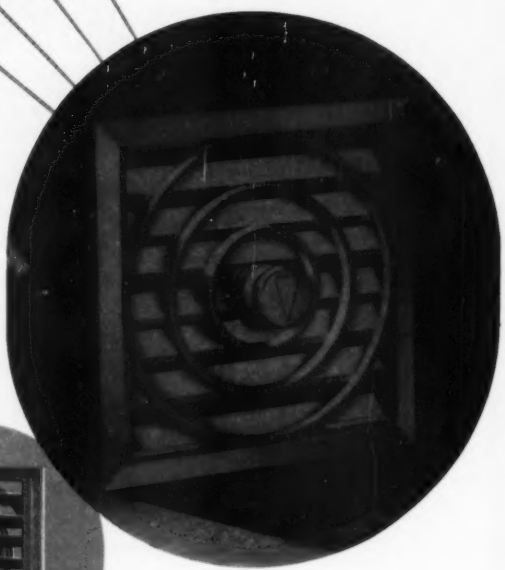
it's hard to beat four of a kind

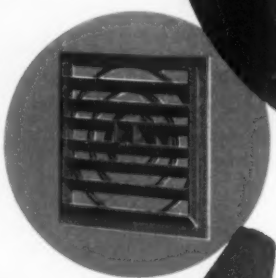


YORKAIRE ROOM CONDITIONER
adds a smart style note by the clever use of four plastic grilles. A tricky molding job produced to close tolerances by Aico.

Yes, it's hard to beat the multiple use of identical plastic parts as a means of cutting costs. It's even harder to find a molder better qualified than American Insulator to advise on the practical use of such parts. As a pioneer in the industry, we have made it a point to keep abreast of the latest developments . . . to expand our facilities to keep pace with the constant increase in the use of plastics. Aico's *complete* molding service includes injection, compression, low-pressure and cold molding . . . permits Aico engineers to make an unbiased recommendation on every plastic application. So, consult Aico *first* . . . get the *last word* on the proper use of plastics in your products.

AMERICAN INSULATOR CORPORATION
New Freedom, Pa.

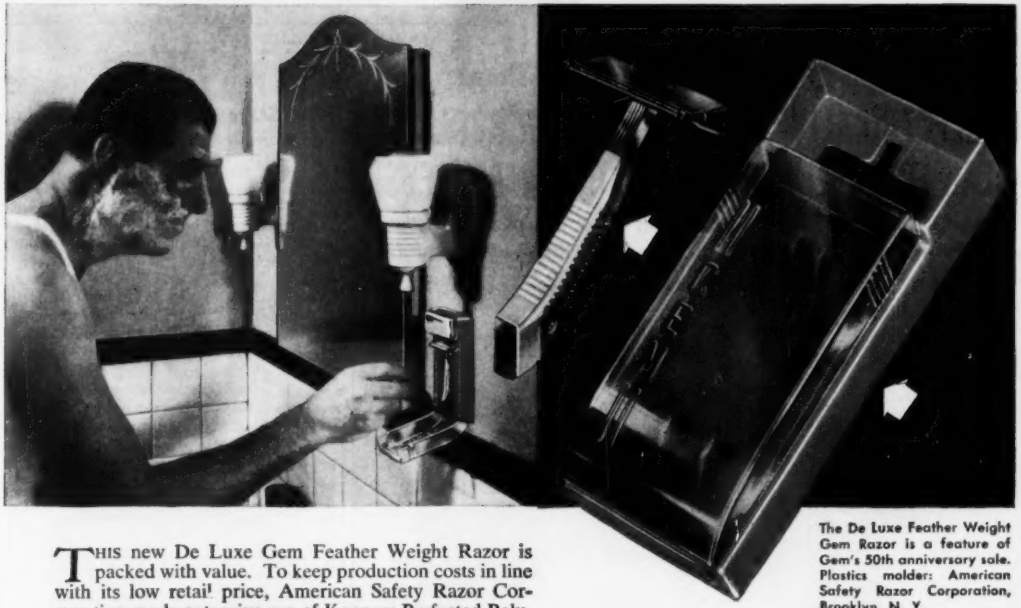




A single cavity, high speed injection mold is used to produce this grille. Daily production is 2,500 pieces on a 30 second cycle. Polystyrene material is used because of its low moisture absorption and dimensional stability. Aico's "Portfolio of Plastics Application" contains many hints on the economical, practical use of Plastics. Write for your free copy today.

MANY THINGS ARE BETTER BECAUSE OF Aico MOLDED PLASTICS

To shave production costs GEM used Koppers Polystyrene



The De Luxe Feather Weight Gem Razor is a feature of Gem's 50th anniversary sale. Plastics molder: American Safety Razor Corporation, Brooklyn, N. Y.

THIS new De Luxe Gem Feather Weight Razor is packed with value. To keep production costs in line with its low retail price, American Safety Razor Corporation made extensive use of Koppers Perfected Polystyrene.

THE HANDLE is molded from Koppers Polystyrene 8X. High heat distortion temperature . . . fast, easy moldability . . . light weight (the entire razor weighs only an ounce) made Polystyrene 8X the ideal material for this application.

THE CASE is molded from Koppers Polystyrene 3X. The transparent, hinged cover—made of crystal-clear, jewel-like Polystyrene 3X—displays the product perfectly. The case proper is a lasting, stable red—no weak, limpid coloration. It can't rust, corrode or deteriorate.

Koppers experience in molding techniques and the assistance of Koppers technical experts played an important part, too, in solving production problems and developing a perfect molded project.

You, too, can take advantage of the lower material costs, lower molding costs and improved product appearance that result from using Koppers Perfected Polystyrenes. Mail the coupon below for a copy of "Koppers 1950 Polystyrenes."

KOPPERS POLYSTYRENE gives you all these advantages

- **Low cost**
- **Light weight—more pieces per pound**
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- **Excellent electrical properties**
- **High heat distortion temperature**
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Koppers Company, Inc.
Pittsburgh 19, Pa.
Chemical Division, Dept. MP-6

Please send your booklet on Koppers 1950 Polystyrenes.

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PLASTICS MACHINERY BULLETIN

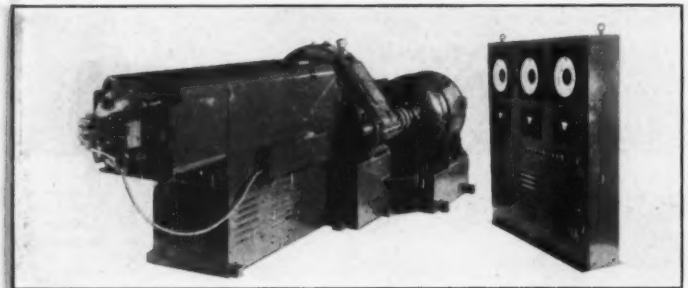
Reporting News and Machine Design Developments

IN BUSINESS TO **NRM** REDUCE YOUR COSTS

6″ ELECTRICALLY HEATED EXTRUDER ACCLAIMED IDEAL FOR PELLETIZING; ALL OTHER PROCESSES

Torpedo-type Screw and Balanced Heat Control: Two Exclusive Features Give More Uniform Extrusions at Lower Costs

The NRM 6″ all-electrically heated extruder is an all-round "work-horse" of the plastics extruding industry. NRM's 6″ extruder has proved ideal, *on-the-job*, for every kind of standard extrusion process, pelletizing, wire and cable covering, etc.



NRM 6″ electrically heated extruder and control panel. Nominal capacity: 400–500 lbs. per hour. Screw speeds: 8 to 64 rpm. Temperature range: 750° F. 75 hp variable speed drive.

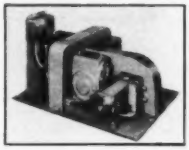
One of the main reasons for NRM's overwhelming superiority is the fact that NRM pioneered plastics extruders are built *solely* for thermoplastics extrusion. Because of this, NRM has developed features such as the exclusive *Torpedo-type Screw* and *Balanced Heat Control*.

The Torpedo-type Screw makes possible maximum production and uniform extrusions with close tolerances when working with rigid compounds such as cellulose acetate, ethyl cellulose, polystyrene . . . and often with elastomeric compounds such as polyethylene.

Balanced Heat Control gives you *absolute control over frictional heat with no compressed air, no pipes, no oil or water cooling* at a temperature range up to 750° F.

Find out now how NRM equipment can save you money and improve production quality. Write for complete details to Plastics Division, National Rubber Machinery Company, Akron 8, Ohio.

1″ Bench Model Extruder suited both for Lab. Work and Regular Production

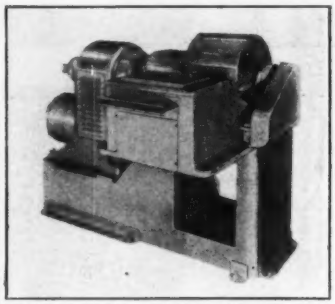


NRM's 1″ Bench Model is available both electrically and steam heated. With a nominal capacity of 6-10 lbs. per hour, the Bench Model is *tops* for either laboratory work or small capacity regular production or both. The Bench Model has as an accessory a combination tubing die and wire covering crosshead enabling, for example, experimental work to be done with special materials or small production processes to be carried out.

From Serrated Strips or Multiple Strands — Up to 1,500 lbs. of Pellets per Hour!

NRM Choppers are complete units for chopping pre-formed serrated plastic strips or multiple strands of rigid materials into uniform pellets. Nominal capacity is 500 lbs. per hour (Model "500") and 1,000 lbs. per hour (Model "1000"). However, under certain conditions on some installations, production of 1,500 lbs. has been obtained with slight modifications of design.

All NRM Choppers models have forged steel rotors. The four flying Knives and 1 bed Knife of "battle-axe" grade steel are easily adjustable and are replaceable. Drives for the Model "1000" is 10 hp U. S. Varidrive, for Model "500", 5 hp.



NRM Choppers have welded steel housings with hinged covers for accessibility to the rotor. "Fines" may be removed through a chute which has an easily accessible and replaceable vibrating screen.

NRM chopping machines team perfectly with other NRM equipment in a pelletizing "line-up". Many typical installations include the famous NRM 6″ extruder with the die, the NRM Universal Take-off Conveyor, a water cooling trough and an NRM Chopper for high quantity production of uniform pellets.

For complete details or specifications on any of this equipment, write to NRM at Akron, Ohio.

ONLY NRM equipment includes sizes ranging from the 1″ Bench Model to the huge 12″ NRM extruders for special applications. All available for electrical, oil or steam heat.

NATIONAL RUBBER MACHINERY CO.

General Offices & Engineering Laboratories
Akron 8, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J.
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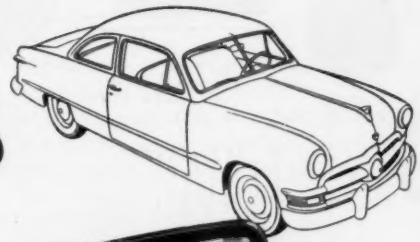
EXPORT Plastics Machinery: OMNI EXPORT CORPORATION
460 4th Ave., New York 16, N. Y.

Creative Engineering

...New...for '50 PLEXIGLAS Crests for...



PLEXIGLAS crests ride fore and aft on Ford's new cars for 1950. First coat of arms mounted by Ford, the new emblems are molded of transparent PLEXIGLAS V with metallic inlay applied on back of the finished molding. The design, molded in intaglio, stands out so realistically that it appears to be embedded in the sparkling plastic.

Molders: Gits Molding Corporation, 4600 W. Huron Street, Chicago. Hoosier Cardinal Corporation, Evansville, Ind.

PLEXIGLAS V injection molding powder combines *all* the traditional advantages of acrylic plastics —plus exceptional ease of molding. PLEXIGLAS V products have lustrous beauty, great dimensional stability, high heat distortion temperature, and outstanding resistance to age and weather.

More and more PLEXIGLAS V is going into automotive appointments and decorations. Steering wheel medallions, lenses, radiator ornaments, radio panels, escutcheons, and a score of other long-lived parts are being molded from this sparkling acrylic powder. For products of lasting beauty, get the complete story of PLEXIGLAS V today. Our nearest office will be glad to discuss your molding problems—or if you prefer, get in touch with us direct.

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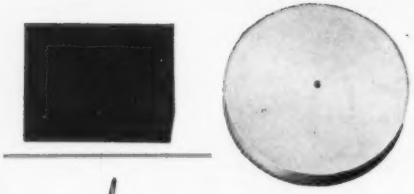
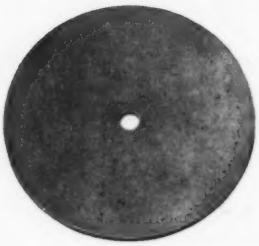
Canadian Distributor: *Crystal Glass & Plastics, Ltd., 282 St. Helens Avenue, Toronto, Ont.*





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7" Diameter, 4" Thick

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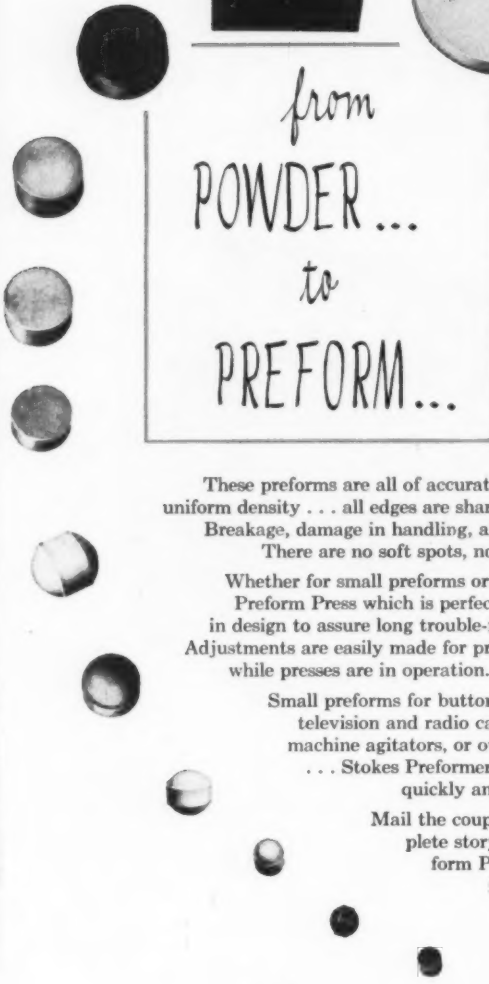
Mail the coupon for the complete story of Stokes Preform Presses ... there is no obligation.



STOKES MAKES Automatic and Semi-Automatic Molding Presses, Plunger Presses, Closure Presses, Preforming Presses, Industrial Tableting and Powder Metal Presses, Vacuum and Special Processing Equipment, Water Stills and Special Machinery.

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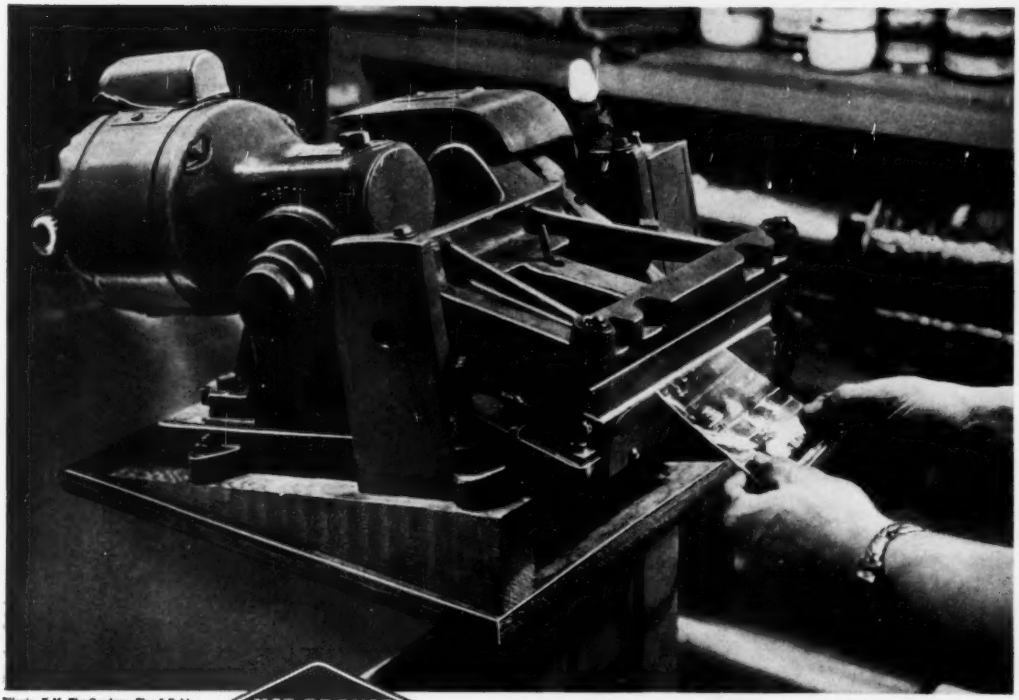
use PLIOVIC AO

PLIOVIC AO is a high molecular weight, high vinyl chloride content resin developed by Goodyear for organosols. These dispersions can be fused into strong, tough films and coatings at temperatures as low as 300° F.—considerably lower than comparable resins.

Organosols made with **Pliovic AO** can be heat-sealed at 250° F.-275° F. Clear or colored unsupported films and coatings for fabric and paper are readily obtainable with **Pliovic AO,** and films are pliable, tough, have excellent tear resistance, high clarity and excellent "hand" and "drape."

Similar properties can be secured in calendered and extruded items through the use of **Pliovic A.** Write today for full details on both forms of **Pliovic** to:

Goodyear, Chemical Division
Akron 16, Ohio



Laboratory tester forming strong heat seals with **Pliovic AO** *in organosols at temperatures in the 250° F. range.*

Pliovic—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

USE PROVED *Products*

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How to save *most* in assembly

SKIPS TAPPING, AVOIDS INSERTS, MAKES STRONGER FASTENINGS

Timely Toys, Inc. chose P-K Type Z Self-tapping Screws to fasten the metal base plate and mechanism to the polystyrene shell of this popular Turnabout toy car. Screws are driven rapidly with a power driver, and the strong, rigid fastening withstands shock and abuse. Manufacturer says, "No other method would give us the production speed wanted without breakage." Find out how you can make similar savings in time, avoid breakage, and add strength.

Choose the "*short cut*" fastening method

When you make fastenings with Self-tapping Screws, you simply drive them in plain, untapped holes. You avoid tapping for machine screws, inserts in plastics and other assembly-slowing operations like nut-running and riveting. Stripped threads, tap breakage, and parts spoilage are no longer a problem, and your assembly is stronger. But choosing this common sense *method* is only the first step.

TYPE Z
(also made with Phillips Head)

Let P-K* fit the fastener to the job

Only Parker-Kalon offers a complete line of Self-tapping Screws. P-K fits the right fastener to your needs, not your needs to a fastener. Another reason why P-K can help you save most is their 35 year experience as Self-tapping Screw specialists. P-K applications number more than a million, many with savings up to 50% and over.

Find out what you can save. Call in a P-K Assembly Engineer, or send assembly details for recommendation.

Remember, the actual cost of screws depends, never on price, *always* on performance. Specify P-K Self-tapping Screws, and you'll see why the makers of so many of the nation's best-known products say—IF IT'S P-K . . . IT'S O. K.!

Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y. Sold everywhere through accredited Distributors.

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P-K Type A or Z, in No. 0 or 00 diameter, with a No. 0 Phillips Recess, can be made to order, quantity permitting.

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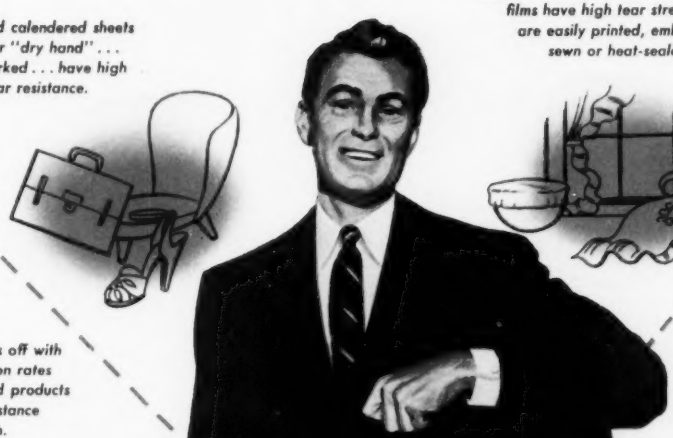
The Original
PARKER-KALON* SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

Marvinol-based calendered sheets have superior "dry hand" . . . are easily worked . . . have high stitch-tear resistance.

Cast, calendered or extruded Marvinol-based films have high tear strength . . . are easily printed, embossed, sewn or heat-sealed.

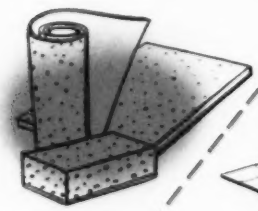


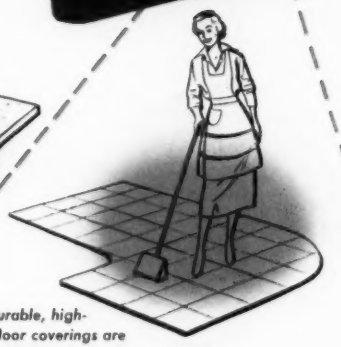
Marvinol pays off with faster extrusion rates . . . makes end products with high resistance to cut-through.

Adaptable to injection, low pressure, compression, slush and blow molding, Marvinol gives strong, durable products with sharp detail.

Marvinol® vinyl resin puts these extras in your sales story

Marvinol is being used in new vinyl compositions to make tough, lightweight cellular products.





Colorful, durable, high-style floor coverings are processed from high molecular weight Marvinol formulations.

IN HUNDREDS of processes, in thousands of end products, Marvinol vinyl resin is giving processors the characteristics that mean sales. Marvinol formulations are stable under heat, light and time . . . have high dimensional stability, greater low-temperature flexibility, outstanding resistance to wear, tear, oils and acids.

Let us show you how to utilize these extras in Marvinol. All technical information developed in our modern laboratories is at your disposal since it is through you that Marvinol-based products reach the consumer. Write today for the latest technical information. Dept. M-6, NAUGATUCK CHEMICAL, Naugatuck, Connecticut. *In Canada*, Naugatuck Chemical, Elmira, Ontario.

Other Products of Naugatuck Chemical: SPERGON fungicide for seed treating • PHYGON orchard and row crop spray fungicide • TUFOR 2-4-D weed killers • SHRINKMASTER process for rendering woolens shrink-resistant and long-wearing • SURFA-SEALZ rubber compound for surfacing highways • KRALAC molding powders • VIBRIN Polyester resins • PQL chemical and heat resistant baking enamel • LOTOL compound latices, natural and synthetic • DISPERSITE water dispersions of reclaimed rubber and resins • Reclaimed Rubber • Aromatics • Synthetic Rubber • Rubber Chemicals • Raw Latex • Plasticizers

Marvinol

NAUGATUCK CHEMICAL

DIVISION OF UNITED STATES RUBBER COMPANY

HOW TO DROP $10,000.00 and not lose a cent

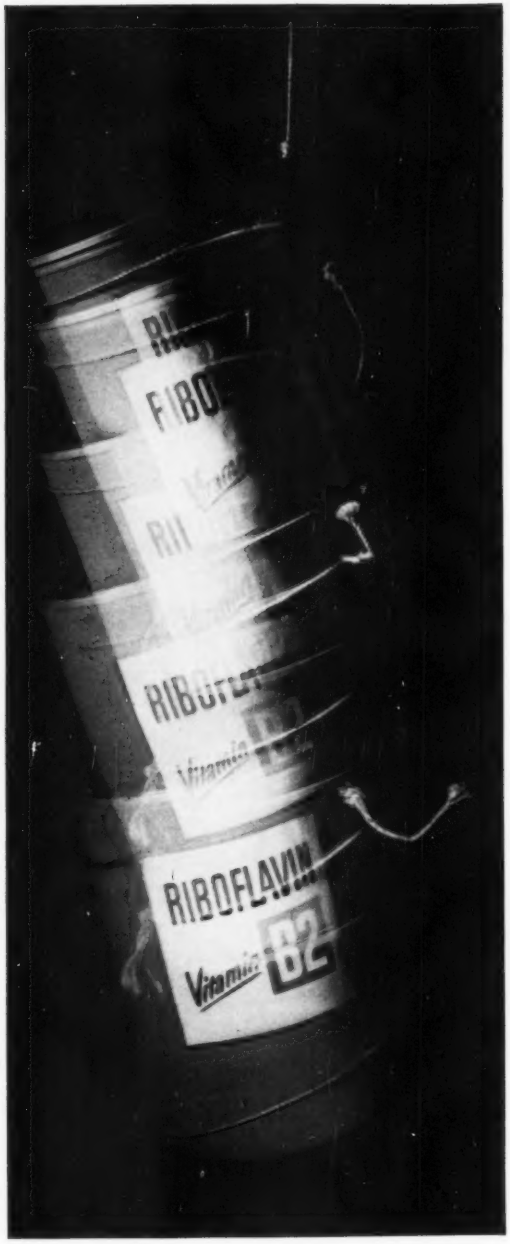
If you shipped riboflavin—a widely used vitamin—the very thought of somebody dropping one of your shipping drums would give you gray hairs. A single drum of riboflavin is worth upwards of $10,000. But one of Continental's regular line of shipping drums—the Leverpak drum—is the choice of many companies for safeguarding their most valuable products.

The stroboscopic photograph at the right shows a Leverpak drum containing four hundred pounds dropping four feet. It didn't leak, shatter or fracture. *Not a penny's worth of the contents will be lost!*

This Leverpak drum is just one example of Continental's ability to develop packages to meet exacting requirements. Like all Continental drums, it is light in weight to save shipping costs, and can be furnished in a wide variety of linings and coatings.

Whatever your product, Continental can supply you with a package that will stand up in service, stand out in appearance. Continental is famous for its fine lithography and decorative work. Drum, can, or paper container—if you have a packaging problem, our technical staff is ready to help you solve it. Continental is big enough and flexible enough to handle any packaging situation.

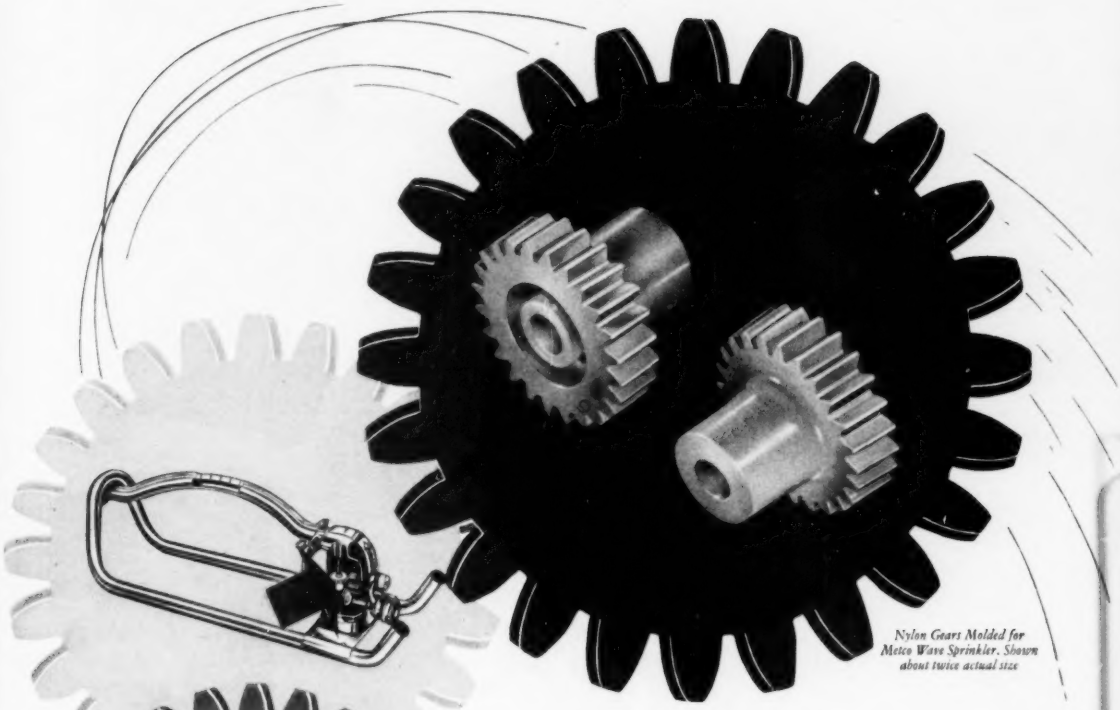
DRESS UP YOUR PRODUCT WITH A CONTINENTAL DRUM. Three types to choose from. The Leverpak drum, with its unique lever-locking device, for maximum protection under hard usage. 12- to 75-gallon sizes. . . The Fiberpak drum—a rigid, light, all-fibre container in ¾- to 67-gallon sizes. . . . .The Stapak drum with fibre body and metal top and bottom. Supplied in 2- to 32-gallon sizes.



CONTINENTAL CAN COMPANY

PAPER CONVERTING DIVISION • FIBRE DRUM SECTION
VAN WERT, OHIO

New York • Philadelphia • Pittsburgh • Tonawanda • Cleveland
Chicago • St. Louis • Los Angeles • San Francisco • Eau Claire



Nylon Gears Molded for Metco Wave Sprinkler. Shown about twice actual size

Skillful Molding

DOES A WELL GEARED JOB

". . . For long life with low wear, a non-metallic gear was a design requirement for the Metco Wave Sprinkler. We chose molded gears for economy and because of the wide range of materials which can be molded. We chose nylon as the molding material because of its high wet strength, low moisture absorption and abrasion resistance when operated with water as the only lubricant."

This excerpt from a letter by Mr. C. K. Wilson, Design Engineer for Metallizing Engineering Company, Long Island City, New York, effectively presents a strong case for molded gears.

If Mr. Wilson had continued in that vein, he might also have said, "We chose Elmer E. Mills Corporation because it is one of the few molders in the country equipped to mold nylon gears."

Why? Because this type of thermoplastic molding presents a challenge few molders care to meet. Since these were undercut "helical" gears instead of the straight "spur" gears, their production presented an unusually difficult job of molding and tool making. Despite the fact that only a few molders can make them, the use of thermoplastic gears is very much on the increase.

Wherever they are used, it is either a case of greater production economy, functional superiority, or both.

So when you are studying the problem of gears for your products, consider the advantages of nylon or other thermoplastic gears. Then let us show how well geared we are to solve this problem for you.

Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about [redacted] piping, tubing and fittings, write for circulars containing data and illustrations.*

*Trademark Registered

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Nylon, Plexiglas, Polystyrene, Styron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, [redacted]*, Saran, and other Thermoplastic Materials.

2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS

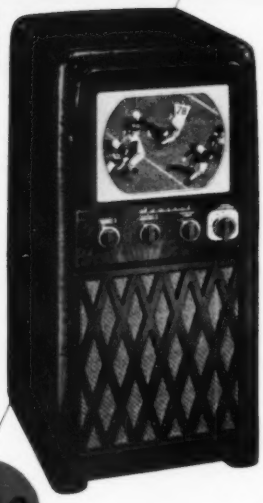
First plastic radio-phonograph cabinet ...at that time the largest plastic casting ever. More than 300,000 delivered by **MPc** to date.

1947

First plastic television cabinet ... involving an unprecedented draw 16¾ inches deep.

1948

First plastic television console, weighing about twice as much as the largest casting theretofore compression molded.



1949

BIGGER ... AND BIGGER AND BETTER

MOLDED PLASTIC CABINETS

1950

First again!... with a plastic console cabinet to house a 12½ inch television receiver.

What next in plastics? The record of **MPc** achievement for Admiral points the direction...opens tempting new vistas to the product design engineer.

MPc has pioneered the production of larger, heavier, finer plastic castings. The continuing series of "firsts" pictured here suggests fascinating new uses for molded plastics with their many unique properties, their beauty and low cost.

MPc has the equipment to tool and mold the big ones...yes, and the necessary vision and experience too! Product designers are invited to consult with MOLDED PRODUCTS CORPORATION. 4539 West Harrison St., Chicago 24, Illinois.

MPc

PLASTICS DIVISION

MOLDED PRODUCTS CORPORATION

MR. PRODUCT DESIGNER
Improving present products?
Designing brand new ones?
Trying to cut costs?
"We tenderized sales-resistance when we disca habit-itis"
"This product would have been impossible...if we hadn't scrapped habit-itis first"
E. V. Alvarez
"We defied habit-itis and three best sellers were born"
"Picture-in-a-minute... because we erased a century of habit-itis"
J. H. Booth

MR. CUSTOM MOLDER:

Are your prospects burdened with habit-itis?

A new Monsanto campaign stimulates more business for custom molders

How many hundreds of "impossible" or "best-seller" products in plastics . . . like those dramatized in the advertisements above . . . are yet unborn?

Monsanto is turning the spotlight on this vast pool of prospective business for custom molders. Presenting powerful evidence in favor of a fresh approach to new methods, new materials . . . perhaps plastics . . . that can help manufacturers produce better, faster-selling products, at lower cost.

A continuing campaign of Monsanto advertisements in TIME and BUSINESS WEEK is telling top management across the country a series of stirring success stories—dramatic victories over "habit-itis" scored by manufacturers in a wide variety of industries. Like The Quaker Oats Company, for instance, with its new record-breaking plastic premiums. And the Polaroid Corporation, using Monsanto plastics to make its new "picture-in-a-minute" Land camera a functional success. These examples are stimulating others to banish "habit-thinking," and to put Monsanto Plastics and a custom-molder's experience to work for themselves.

Monsanto's business ads are penetrating right to the top management decision-makers in the industries you serve, who so often today initiate changes in methods or materials. Similar ads in industrial trade papers are also spotlighting "habit-itis" among designers and engineers.

But, advertising is only a beginning. Not the end. Monsanto does much to encourage manufacturers to get on your bandwagon.

For instance, the Monsanto Information Center, set up at the recent Plastics Show in Chicago to help custom molders meet manufacturers and get in touch with prospective customers. Monsanto's Technical Council. The now-famous "Bigger Plastics Dollar." On-the-spot technical aid. A continuing direct mail program. And the extensive research facilities, and technical know-how of Monsanto.

NOTE: *If you are not now using Monsanto plastics, it will pay you to investigate the advantages of Monsanto quality, service, and dependability. Write today, or use the coupon, for complete information on how Monsanto's wide range of plastics can help you.*

SERVING INDUSTRY WHICH SERVES MANKIND

MONSANTO
CHEMICALS—PLASTICS

MONSANTO CHEMICAL COMPANY, Plastics Division, Dept. MPLP 30
Springfield 2, Mass.

Please send me "What Monsanto Plastics Can Do For You."

Name & Title _____

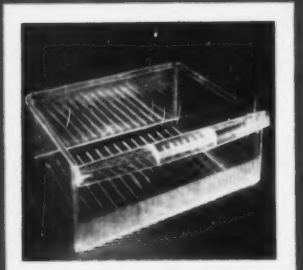
Company _____

Address _____

City, Zone, State _____

JACKSON & CHURCH
CUSTOMER REPORTS. . .
CINCINNATI ADVERTISING PRODUCTS CO.

Production run on JC 64 oz. molding machine



Refrigerator compartment made of impact styrene. Weight 47 ozs.

Refrigerator tray made of impact styrene.

REPORTS ON SUCCESSFUL OPERATION OF 64 OUNCE PRE-PLASTICIZING PRESS CAPABLE OF 500 OR MORE SQUARE INCHES PROJECTED AREA.

"On our new Jackson and Church press," according to Cincinnati Advertising, "the mold was the limiting feature. We had plenty of plasticizing material for the 47 ounce crisper pan which was molded under extremely low pressures. We can safely say that the parts were more strain free and that the finish on the crisper pan in impact styrene was good, and limited only by the condition of the mold which had been in considerable previous service. Through definite experience, we have found that approximately one ton per square inch is *ample* clamp pressure."

"We are pleased with this Jackson and Church press, and do not feel that on this initial job we have even approached the maximum press capacity in the size of castings nor in production cycle."

"If you have any difficult jobs, even though they are now only in the experimental engineering stage, perhaps we can be of assistance to you with this new Jackson and Church press."

Statement of Cincinnati Advertising Products Company on file at Jackson and Church Company.

CAPACITIES AND TIME SAVING NEVER HERETOFORE POSSIBLE

TO DATE: on injection molding machines of conventional design, the injection chamber and its ability to plasticize material has been the limiting feature.

NOW: on a Jackson & Church Pre-plasticizing Press* the mold is the limiting feature. When the mold says . . . "Take the piece out" . . . the next shot is ready to go.

THINK OF IT! . . . 410 lbs. of styrene per hour . . . 500 square inches projected area.

WE REPEAT . . . with the Jackson & Church Press your opportunities are unlimited—with mold design only limiting factor.

REMEMBER . . . YOU CAN SAVE 5¢ PER POUND BY COLORING & INJECTION MOLDING STYRENE ON THE JC PRESS

A PRODUCT OF

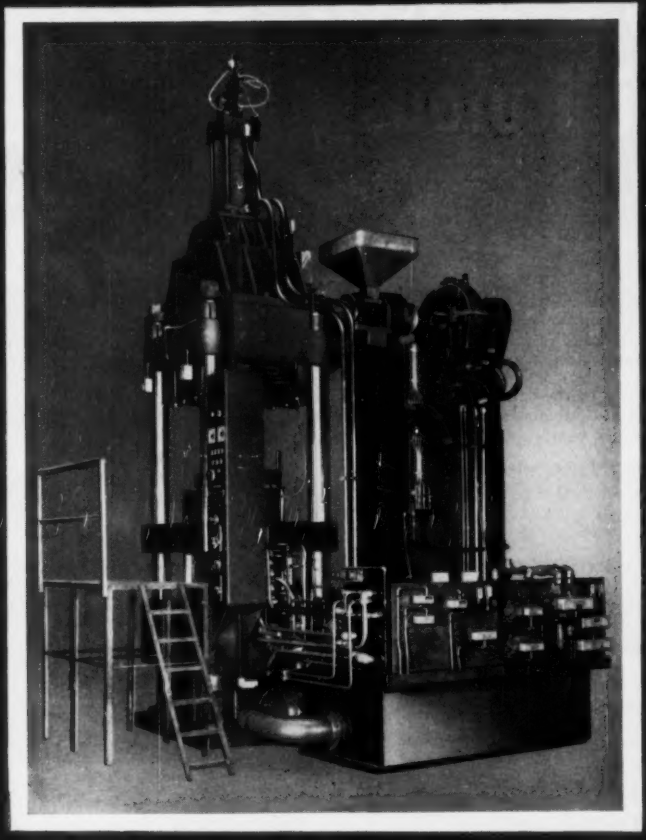
J-C JACKSON & CHURCH CO.

SAGINAW, MICHIGAN

WORK WELL DONE SINCE '81

★ PRE-PLASTICIZES OVER 410 LBS. STYRENE PER HOUR

★ 500 SQ. INCHES PROJECTED AREA



Ounces Per Shot	64 oz. (Styrene)
Time Cycle for 64 Oz.	45 Seconds
Total Poundage Per Hour	410 Lbs. (Styrene)
Pressure Per Square Inch on Material in Injection Chamber	12,000 psi Maximum
Diameter of Plunger	3½" Diameter
Diameter of Screw	4½" Diameter
Speed of Screw	85 to 220 rpm
Projected Area	500 Square Inches
Locking Pressure	500 Tons 572 Actual
Stroke of Clamp Cylinder	27" Min. 36" Maximum
*Patents Applied For	

Speed of Closing	28 Inches Per Second Slowed Down to 10 Inches Min. for Operation
Speed of Opening	40 Inches Per Second Slow Down for Operation
Adjustable Daylight Opening	19" to 36"
Adjustable Platform Opening	24" to 42"
Direction Platens Re Rails	Left to Right 32" Front to Back 32"
Floor Space Required	140 Square Feet
Approximate Weight	40,000 Pounds

AVAILABLE IN 24, 48, 64, AND 80-OZ. MODELS

chest x-rays for my employees? . . ridiculous

Not so ridiculous, mister! Chest X-rays may show that people who feel in the "pink" are really suffering from active tuberculosis. In its early stages TB frequently has no symptoms at all.

It now leads all other diseases as the cause of death between the ages of 15 and 34. Tuberculosis kills almost 50,000 Americans every year.

This is shameful . . . shameful because it is a disease that can be wiped out if we will all take the first simple step required to wipe it out . . . have a periodic chest X-ray.

Tuberculosis costs the United States 1,000,000 working years annually and, for TB Hospital maintenance alone, more than $1,000,000 in taxes. How could you make a better investment than to lend a hand in helping to rid the country of this scourge!

Post this page on your bulletin board. Let your employees know that the greatest safeguard against TB is excellent health. Active disease does not occur so long as the body's resistance can successfully fight the TB germ.

Let them know that TB is contagious. It is spread through sneezing, coughing and personal contacts.

Let them know that TB is curable, and that the sooner it is detected, the quicker the cure.

Let them know, above all else, they will be doing themselves a favor, their families and community by having their chests X-rayed at least once a year . . . starting TODAY!

Your cooperation can help save lives . . . maybe your own.

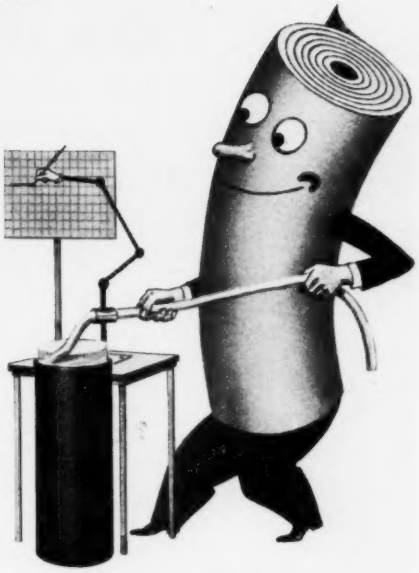
the Advertising Council, inc.

A non-profit organization representing all phases of advertising, dedicated to the use of advertising in public service.

25 West 45th St., New York 19, N. Y.

PUBLISHED IN THE PUBLIC INTEREST BY MODERN PLASTICS

CHECKING EVENNESS OF ROVING WITH LINEAR REGULARITY TESTER. One of a series of laboratory controls throughout production to assure fabric uniformity in all Mt. Vernon-Woodberry products.



UNIFORMITY

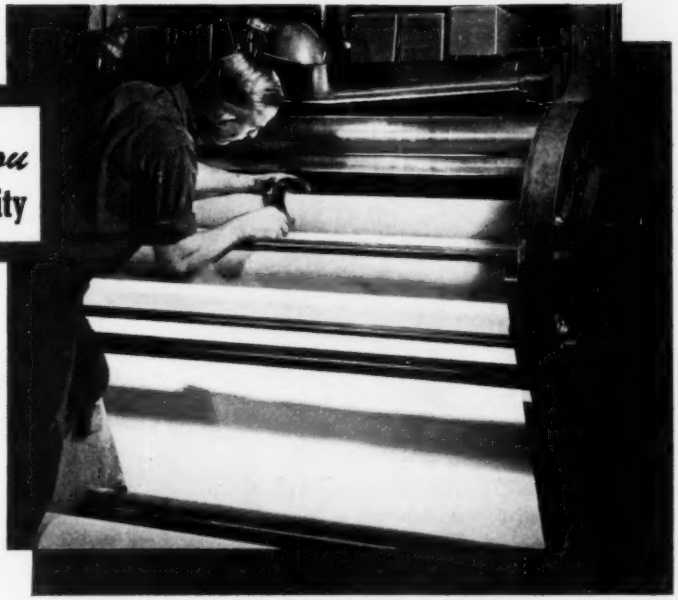
Makes the Big Difference

In LAMINATION Fabrics

MT. VERNON — EXTRA

Gives You

Greater Fabric Uniformity



The rigid laboratory checks which control the production of Mt. Vernon Extra fabrics assure the high degree of uniformity you need for dependable lamination.

AT YOUR SERVICE

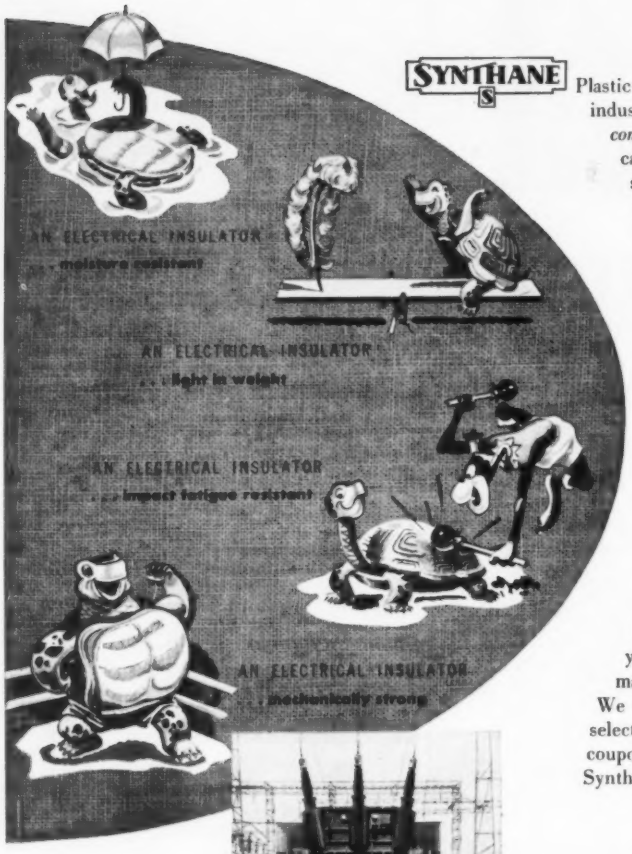
Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

Mt. Vernon-Woodberry Mills

Branch Offices: Chicago • Atlanta • Baltimore • Boston • Los Angeles • Akron

TURNER HALSEY
COMPANY
Selling Agents
40 WORTH ST. NEW YORK

Plastic Laminates that Insulate—May


AN ELECTRICAL INSULATOR
. . . moisture resistant
AN ELECTRICAL INSULATOR
. . . light in weight
AN ELECTRICAL INSULATOR
. . . impact fatigue resistant
AN ELECTRICAL INSULATOR
. . . mechanically strong

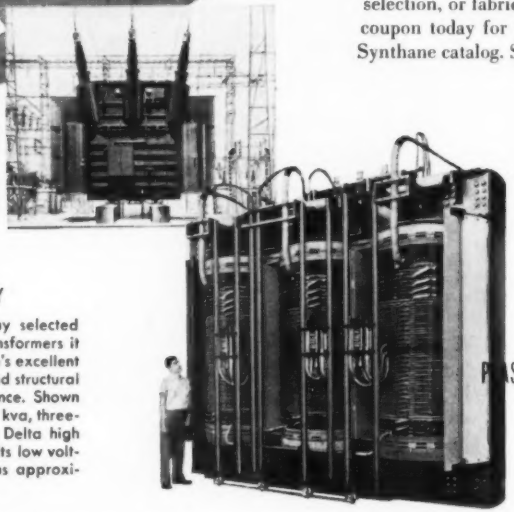
SYNTHANE

Plastic Laminates are materials expressly made for industrial applications. They have an interesting *combination* of electrical, mechanical and chemical characteristics. This combination often stimulates new ideas in design or use, may improve a product or process or reduce fabrication or maintenance costs.

Synthane is an excellent electrical insulator. Synthane is high in dielectric strength, low in dielectric constant and power factor. It is also light in weight, hard, dense, strong, resistant to abrasion, corrosion and moisture, and is dimensionally stable.

Synthane speeds fabrication. Synthane laminated can be machined quickly and easily on standard production equipment or we will fabricate for you. It is also available from us in a variety of molded-laminated or molded-macerated shapes. These are only a few of many Synthane advantages.

Let us help you plan with Synthane. If you are designing a new product or have a materials problem, write and tell us about it. We will be glad to help you with design, grade selection, or fabrication of parts. Clip and mail the coupon today for your free copy of the complete Synthane catalog. Synthane Corporation, Oaks, Pa.



SYNTHANE

AT WORK IN INDUSTRY

The Moloney Electric Company selected Synthane for parts of the transformers it produces, because of Synthane's excellent electrical insulating ability, good structural strength and corrosion resistance. Shown at right is the Moloney 33,333 kva, three-phase, 60 cycle 132000 volts Delta high voltage to 34500Y/19920 volts low voltage. The complete unit weighs approximately 227,000 pounds.

PLASTICS WHERE PLASTICS BELONG

DESIGN • MATERIALS • FABRICATION • SHEETS • RODS • TUBES

Stimulate new ideas *for You*

What else do you look for in an insulating material? Light weight? Strength? Resistance to moisture, corrosion and wear? Dimensional stability? Ease of machining?

Synthane is made in a variety of grades. Each excels in one or more particulars. Each offers a *combination* of useful qualities.

Grades are classified according to the base materials used in them. Paper, cotton, glass fabrics, and asbestos are some of the materials we laminate to produce Synthane. Various resins are used.

At the right are four applications. In each, a different grade of Synthane is used. In each, Synthane gives the manufacturer and his customer a better material because the essential properties are supplemented by a *combination* of other valuable characteristics.

Film Carrier for use in developing solutions, fabricated from a grade of Synthane resistant to corrosion. The grade selected has the added advantages of machinability and general toughness.

Tip Insulators for Welding Electrode Holder. The requirements after electrical insulating stability are resistance to heat and impact fatigue, and, for long wear, toughness.

Automobile Water Pump Seal Washer. Machinability and ease of machining and good wear resistance are essential advantages of the grade used for this part. Additional advantages are light weight and dimensional stability at comparatively high temperatures.

Power Shovel Parts. Electrical insulating ability and mechanical strength are the properties most needed in this application. The grade selected is also wear resistant, easily fabricated to precise dimensions, and can be fabricated directly over metal cores for extra strength.

SYNTHANE

WHERE SYNTHANE BELONGS

MOLDED-MACERATED • MOLDED-LAMINATED

SYNTHANE CORPORATION
8 River Road, Oaks, Pa.

Gentlemen:

*Please send me, without obligation, information on sheets, rods, tubes and fabricated parts,**

*Name*_____

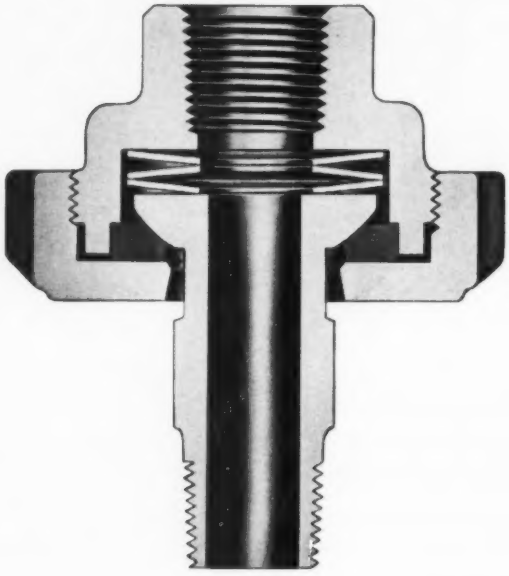
*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

**Free catalogs for companies in United States and Canada.*

Improved Barco Rotary Swivel Joints
FOR MINIMUM FRICTION



FRICTION-FREE PERFORMANCE WITH LOWER TURNING TORQUE. This compact, lightweight, low cost joint is especially efficient at high and low temperatures and pressures. It handles alternating steam and cold water without leakage. It is much more compact for the same capacity and has performed successfully on continuous rotation applications up to 30 RPM. This new, low torque joint will greatly reduce power costs and worker fatigue. It is practically maintenance free.

WIDE TEMPERATURE AND PRESSURE RANGES. The new Barco Rotary Swivel Joints withstand these extreme ranges with complete safety, no chance of bursting. Angular motion compensates for misalignment and there is no restricted internal diameter as in flexible hose.

Install these remarkable joints now. Our engineers will gladly discuss your problems. Sizes ⅜", ½", ¾", 1". When ordering, give complete information about pressures, temperatures, fluids or gases, and any other special conditions.

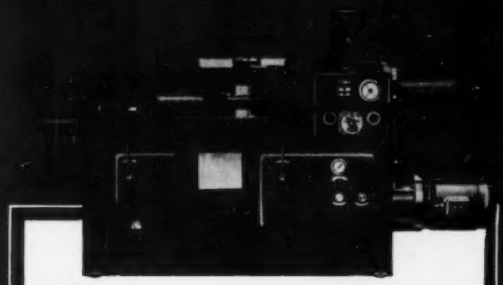
BARCO ***FLEXIBLE JOINTS***

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

Not just a swivel joint ...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

"MOVE IN EVERY DIRECTION"

1809G Winnemac Avenue, Chicago 40, Illinois • *In Canada:* THE HOLDEN CO., LTD., MONTREAL, CANADA



The
S·H·3 INJECTION MOULDING MACHINE

is a hydraulically operated machine of 3 oz. capacity and is driven by a self-contained electric motor; simple to operate, inexpensive in its prime cost and economical to run.

The
S·H·4
AUTOMATIC CONTROLLED CYCLE INJECTION MOULDING MACHINE

Designed to provide a medium capacity machine capable of producing articles weighing up to 4 oz. per shot, in a wide range of plastic materials.

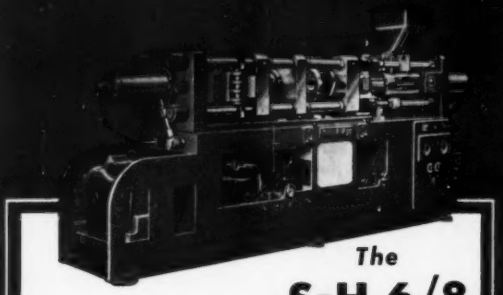
Windsor

The
NEW TWIN SCREW
RC-65
90mm MACHINE

- It Compounds
- It Extrudes
- It Colours
- It Reclaims Scrap

Perfect mixing and plasticizing. Compounding, colouring and pelleting.

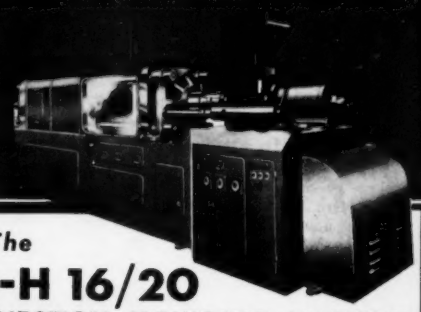
Low operating and power costs. From .010" monofilaments to 10" tubes, strips and special sections. Built to American Standards of Performance.



The
S-H 6/8
INJECTION MOULDING MACHINE

Automatic Controlled Cycle or Hand Operated

Illustration shows machine with panels and guards removed. Other size models H·E·9, H·E·7, E·4.



The
S-H 16/20
INJECTION MOULDING MACHINE

With Automatic Time Cycle Control

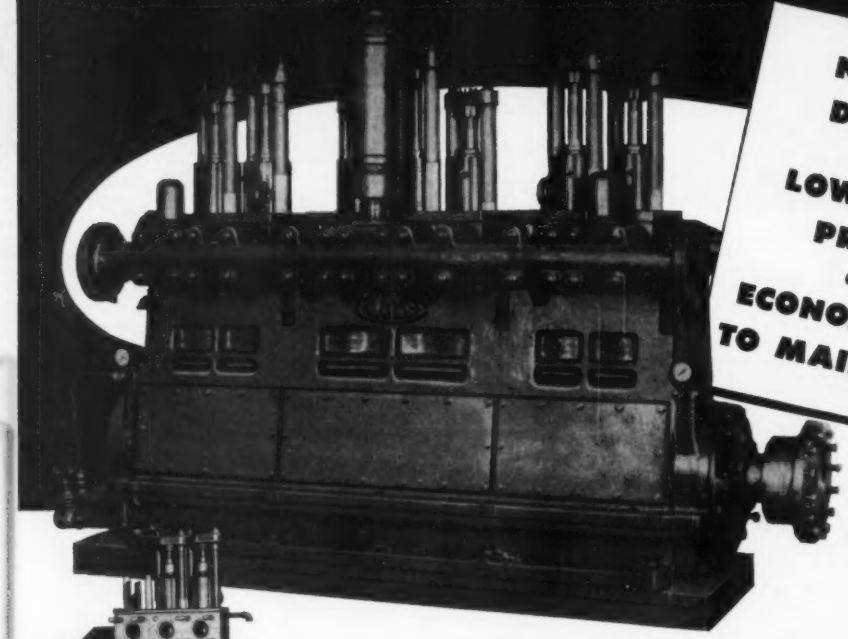
This heavy duty machine is capable of producing articles up to 20 oz. in weight in a variety of materials and incorporates several new features.

R. H. Windsor Ltd.

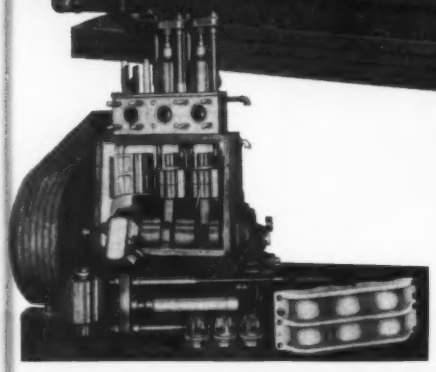
SPECIALISTS IN PRECISION PLASTICS MACHINERY

These Aldrich 5" Stroke Direct Flow Pumps are:

NEW IN DESIGN
•
LOWER IN PRICE
•
ECONOMICAL TO MAINTAIN



Aldrich 5" Stroke Direct Flow Septuplex Pump



● A partially dismantled 5" Stroke Direct Flow Triplex Pump. The fluid-end block is bolted to the top of the frame. The suction and discharge manifolds, bolted to the working barrel, serve as clamps to hold the valves in place. To remove valves, it is only necessary to remove the nuts from the holding studs. Manifolds can then be slid on the studs, affording sufficient room to remove and replace valves which are assembled in complete units for ease of handling.

Molders, extruders, die-casters — all users of hydraulic pressure should know about the simplified construction, the serviceability and maintenance economies that are built into the new Aldrich 5" Stroke Direct Flow Pump.

NEW IN DESIGN: Affording close clearance volumes, the fluid-end has a direct or through-flow design which results in high volumetric efficiencies in handling light as well as heavy liquids. Removable stuffing boxes and two basic sizes of fluid-ends permit change of plungers from 1¾" to 3½" diameter to meet desired pressure and capacity requirements. A *sectionalized* assembly, the fluid-end combines several separate units: a working barrel, valve assemblies, stuffing boxes, suction and discharge manifolds.

ECONOMICAL TO MAINTAIN: As a result of the *sectionalized* fluid-end, one man can easily remove and replace valve assemblies — in much less time than before. And individual fluid-end parts can now be replaced *at a fraction of the cost* of an entire end unit. Other savings include: interchangeability of wearing parts, less costly pump housing, lower foundation expenses, low skidding costs, ease of portability, and light weight. Never before has Aldrich been able to offer top quality construction at such a *low* price.

Write — without obligation — for complete information. Request Data Sheet 64-B.

Representatives: Birmingham • Bolivar, N. Y. Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Duluth • Houston Jacksonville • Los Angeles • New York • Omaha Philadelphia • Pittsburgh • Portland, Ore. Richmond, Va. • St. Louis • San Francisco Seattle • Spokane, Wash. • Syracuse • Tulsa

THE ALDRICH PUMP COMPANY

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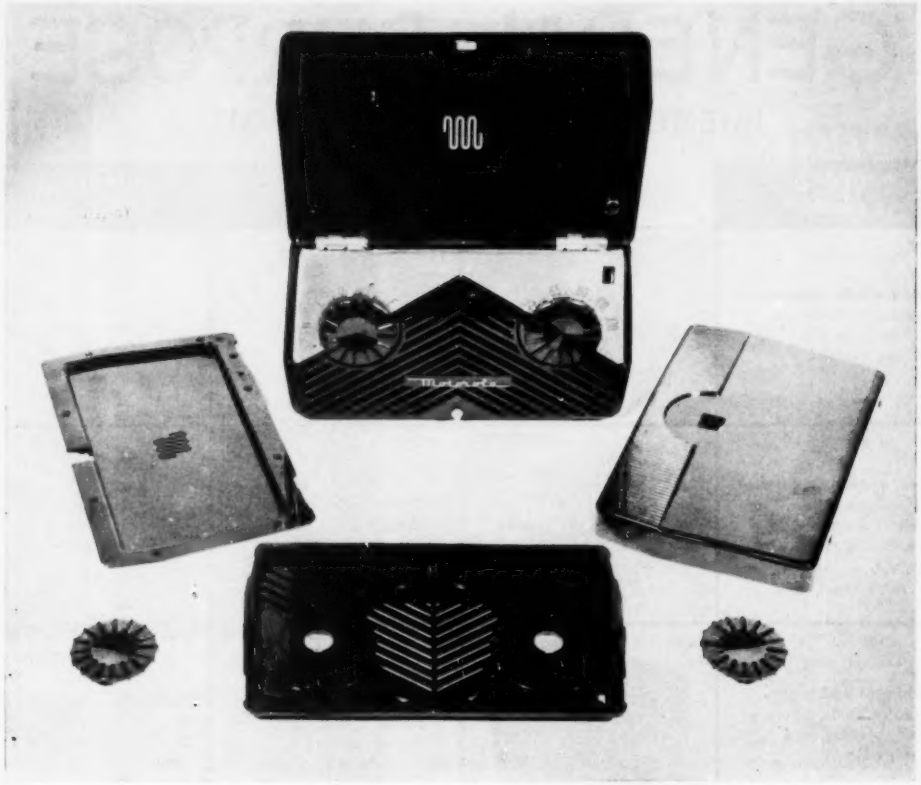

The 1950 model 5M1 Motorola Portable Radio is illustrated above. Also shown are the five parts, consisting of two Knobs, Front Grille, Antenna Loop Back and Cover which are molded by CRUVER and which add materially to the beauty of this fine personal radio.

Parts are Injection Molded in colored Styrene matching the metal body of the set.

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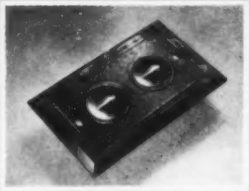
Household items—appliance housings, toilet seats, domestic wiring devices.		Good finish, moderate strength, fast cure, low cost.	For long draw: 560 For short draw: 528 Black or brown
Photo, sports equipment, toys—camera cases, developer trays and tanks, fishing reel parts, etc.		Good finish, moderate strength, fast cure, low cost.	For long draw: 560 For short draw: 528 Black or brown
Cabinets and cases, radio cabinets, novelty cases, playing card cases, etc.		Good finish, moderate strength, fast cure, low cost.	Walnut mottle: 606 Mahogany mottle: S-3261 Black or brown: 560
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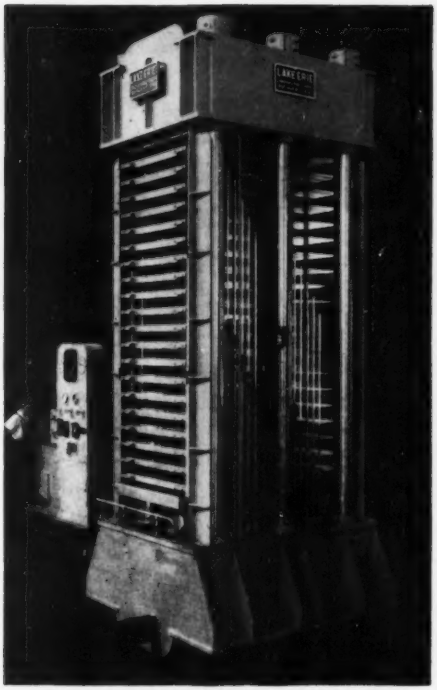
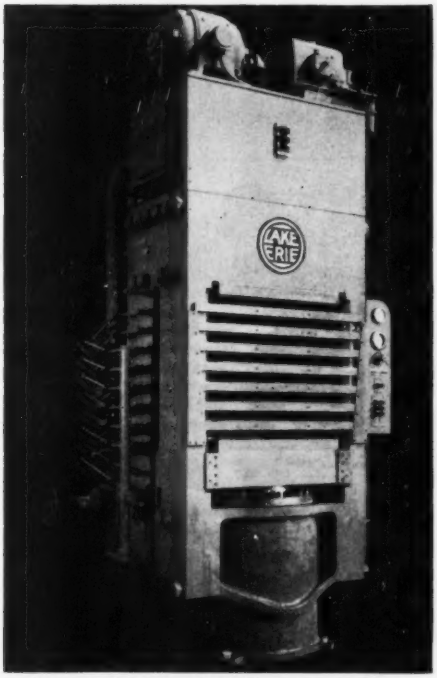


Column type design with 1950-ton capacity. Platens measure 54" x 102".



Rigid side plate design with 1000-ton capacity. Platens measure 42" x 36".

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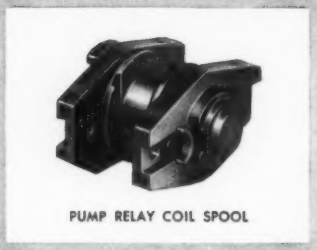
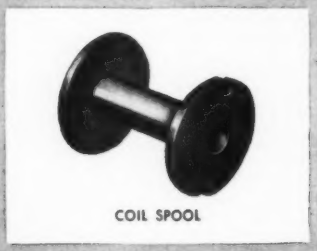


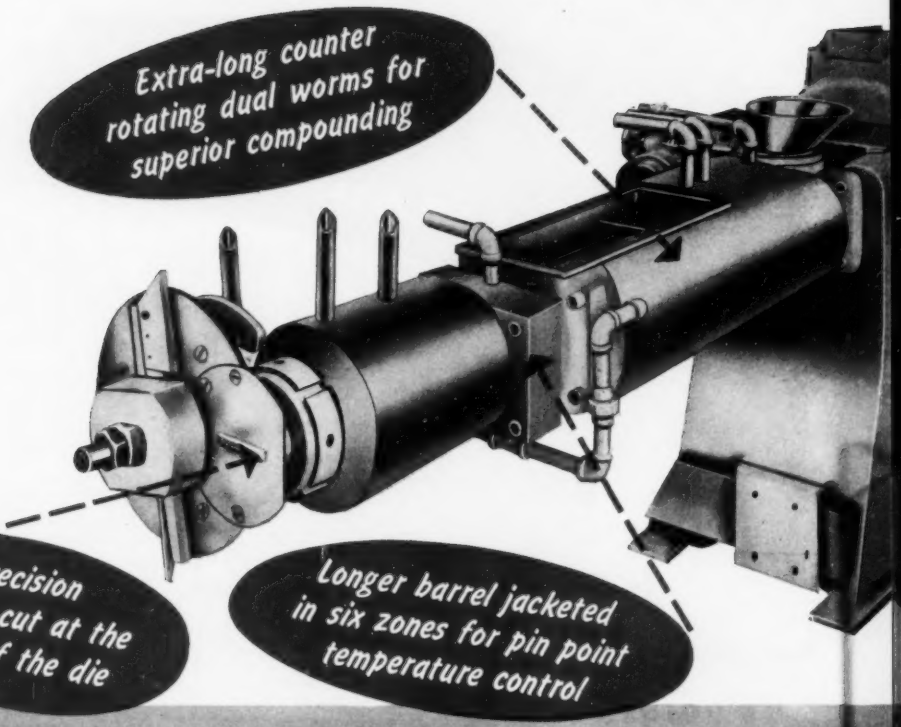
PUMP RELAY COIL SPOOL

SWITCH OPERATING BAR



COIL SPOOL

SWITCH OPENING PIN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Precision pellets cut at the face of the die
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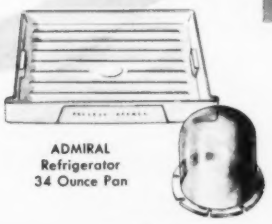

ADMIRAL Refrigerator 34 Ounce Pan

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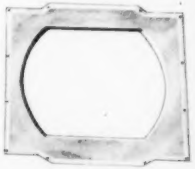

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LOW VISCOSITY... HIGH STABILITY... Plastisols, Organosols!

with Oxidation Resistant* THFO, Plastolein 9250

UNLIKE ordinary THFO, Plastolein 9250 Tetrahydrofurfuryl Oleate is formulated to provide maximum resistance to oxidation and rancidity. Amazingly low in cost yet very effective as a viscosity depressant for Plastisols and Organosols, 9250 also shortens grinding time and produces dispersions with exceptionally fine flow characteristics.

Plastolein 9250 THFO also has wide application as a highly efficient secondary plasticizer for unsupported films, coated fabrics, extrusion compounds and other vinyl applications, because of . . .

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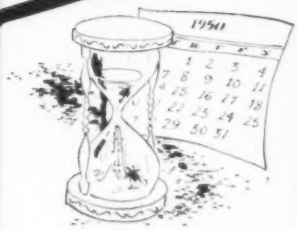
Emery also manufactures a group of Plastolein Plasticizers with low volatility, high water and oil resistance. They are designed to provide low-temperature flexibility and yield films that are clear, free from haze, and have excellent tear strength.

For better products, products that stay better longer . . . buy Emery Plastolein Plasticizers!



OXIDATION TIME TEST

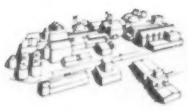
***Plastolein 9250**

330

Regular THFO

48

A measure of oxidation resistance is the time required for the absorption of a standard quantity of oxygen. Naturally, a longer time indicates higher stability. Note that Plastolein 9250 is 7 times more stable than ordinary tetrahydrofurfuryl oleates.



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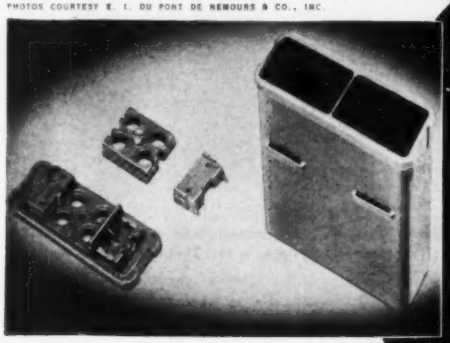
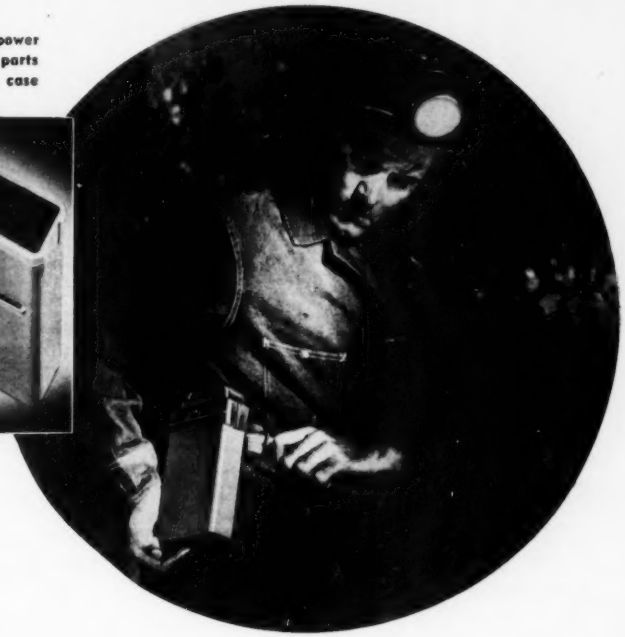
MODERN PLASTICS

VOLUME 27 JUNE 1950 NUMBER 10

Nylon cased miner's lamp (right) gives more power without added weight. Below: Injection-molded parts (left to right): cover, cover block, valve block, case

PHOTOS COURTESY E. I. DU PONT DE NEMOURS & CO., INC.





Why How What Where

Plastics in Batteries

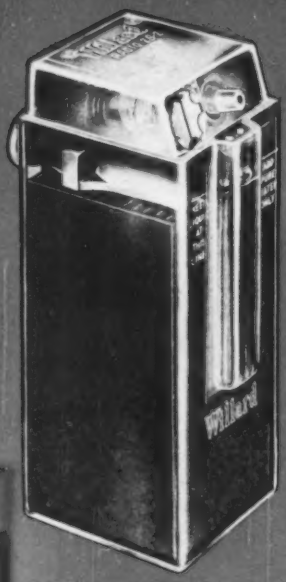
Many different plastics bring high impact strength, light weight, and improved appearance to better batteries

A RELIABLE appraisal of the relative standing of plastics in both the dry and storage battery fields is complicated by the great number of materials represented and by the large number of applications. This much, however, is certain: plastics have attained an important and competitive position in the battery industry—an industry which, during 1948, produced 29 million automotive storage batteries alone.

Although plastics are going into many small battery accessory applications such as chargers, voltmeters, battery cables, and bottles for electrolyte solutions, they find their largest uses in battery cases and storage battery spacers, separators, and vent plugs. Many different plastics—nylon, vinyl, cellulose acetate butyrate, saran, and various styrene copolymers—are used in battery cases. These plastics provide higher impact strength than do molded glass type containers; excellent acid-resisting properties; attractive appearance, which means customer appeal; and light weight, which cuts transportation costs.

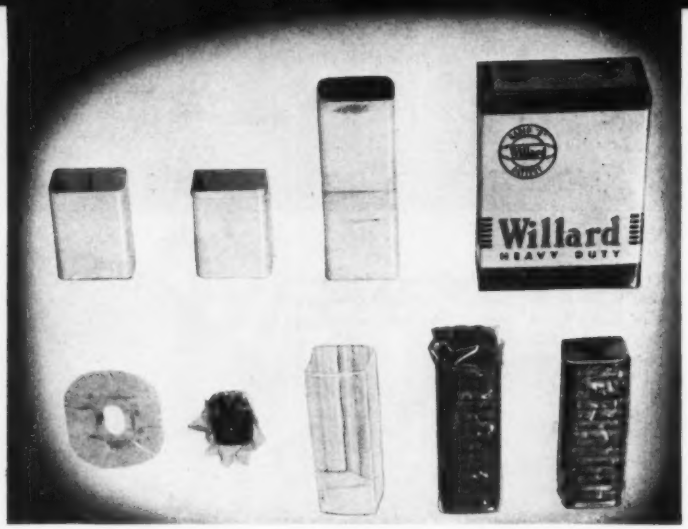
In separators or retainer mats for storage batteries, plastics are used as binders, in some cases; in others, the separators are slotted rigid sheets of plastic. Most retainer mats are made of glass fiber with a binder of acrylic, furfural, styrene, or gelatin depending upon the specifications of the battery manufacturer. The plastic binders, which help to lengthen the useful life and improve the performance of the battery, are non-reactive as well as insoluble in an electrolyte.

Practically all the plastic vent



COURTESY WILLARD STORAGE BATTERY CO.

Transparent styrene battery case has molded-in specific gravity indicator



COURTESY WILLARD STORAGE BATTERY CO.

Lower row: 15 cells enclosed in saran skirts are stacked in butyrate jacket, then placed in two-piece styrene container (upper row). Three units form battery

plugs used in storage batteries are molded of styrene. Most of them are transparent in order to permit visual checking of electrolyte levels without having to unscrew the plug. Special vent plugs have other useful purposes such as restricting the circulation of battery gases and taking off whatever overflow of electrolyte solution occurs.

For the purposes of this article, representative battery cases, separators, spacers, retainer envelopes, vent plugs, miscellaneous applications, and battery accessories were chosen to indicate the increasing trend among battery manufacturers toward using plastics as a means of improving battery efficiency and lengthening battery life.

BATTERY CASES

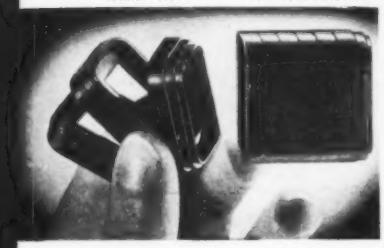
One manufacturer of industrial storage batteries, C & D Batteries, Inc., Conshohocken, Pa., is producing Plasticell batteries of 10 and 15 amp. hr. capacity in two-cell units and 100 amp. hr. capacity in two- and three-cell units for use by telephone companies in PBX and central exchange units.

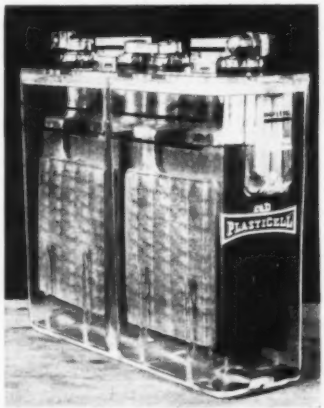
Previously, all C & D battery cases were made of molded glass. The change to plastics (C & D uses Koppers high heat-resistant sty-

COURTESY ELECTRICAL DIV., OLIN INDUSTRIES, INC.

Above: Stacks of 10 butyrate cells are used in hearing-aid batteries. Below: Interlocking sections are rectangular for most space use

COURTESY ELECTRICAL DIV., OLIN INDUSTRIES, INC.





COURTESY C & D BATTERIES, INC.

Telephone unit with molded styrene parts weighs 33% less than glass counterpart

Hearing aid battery, right, has four styrene parts—is shorter than cigarette

rene) was made because of its attractive appearance, light weight, transparency, acid-resisting properties, higher impact strength than glass, excellent aging characteristics, and ease of molding. In addition, the plastic parts (C & D also uses plastics for case covers, vent plugs, and retainer mats) were found to be competitive in cost with other materials, and in the few instances where individual parts were more costly in plastic, the higher cost was quickly offset by savings in shipping costs and in assembly.

All styrene parts for the C & D batteries are injection molded by Mack Molding Co., Inc., Arlington, Vt. The case of the 100 amp. hr. three-cell battery measures 13⅜ in. long, by 8 21/32 in. high, by 7⅞ in. wide, is 20% lighter than the glass type previously used, requires 13.3 oz. of material for molding, and is produced in a single-cavity mold. The cover requires 9.47 oz. of styrene and is also produced in a single-cavity mold.

Tiny Batteries

On the other extreme from the big C & D battery is the tiny Penlite PL Silvercel of the Yardney Electric Corp., New York, N. Y. Used in hearing aids, this diminutive battery is not quite as large as a standard cigarette. It uses four styrene parts, all injection molded by Jersey Plastic Corp., Hamburg, N. J. These parts are the battery barrel, the spacer, the negative insert, and the positive insert.

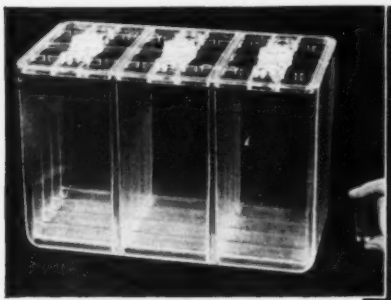
Other Yardney Silvercel plastic batteries include a hearing aid battery and a model used in portable communications equipment. Both batteries have cases and vent plugs molded of styrene. It is claimed that the Silvercel batteries, which are rechargeable, are only one-third to one-fifth the weight of their non-plastic dry cell counterparts. Furthermore, they occupy less space for a given capacity. According to M. N. Yardney, president of the company, "The Silvercel represents one of the greatest advances in storage battery engineering that has been achieved and marks the perfection of an alkaline storage battery using silver and zinc as active materials."

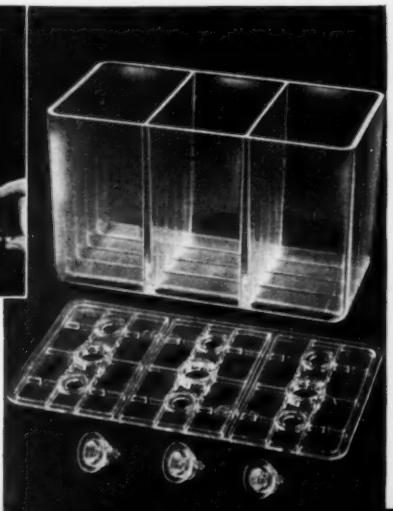
Another rechargeable hearing aid wet-cell battery with a plastic case is being made by Miniature Batteries, Sycamore, Ill. The case, molded of Lustrex styrene by the Jupiter Plastic Co., Chicago, Ill., measures 1¼ by ⅞ by 3¾ inches. The choice of styrene for the battery case lay in its resistance to sulfuric acid. The case is molded in transparent green, thus permitting the liquid level to be checked by sight. The company name and other data are silk screened in white.

Molded Vinyl

Rigid molded vinyl is used for the housing of National Carbon Co., Inc.'s Eveready hearing aid "A" Battery.[1] This cell differs radically from conventional dry cells. No metal oxides are used as depolarizers, this action being secured through the use of highly active, oxygen-sorbing, carbon electrodes. A stable gel-paste, supported by a fibrous mat, immobilizes the required electrolyte which is regenerated as used and so remains unchanged throughout the service life of the cell. The net total of these reactions is simply that of "burning" the pure zinc anode in oxygen drawn from the air through the carbon cathode. In most standard cells the zinc anode is also the outside housing of the battery and is generally encased in cardboard or some other protective covering. When zinc is used as the outer case it must be sufficiently thick so that there is little possibility of any portion of the zinc housing "burning" through during the useful life of the battery. When it was first decided to put National Carbon's new cell to practical test, it was necessary to find a housing material other than zinc which would have the necessary properties and yet be practical from an economic standpoint. After investigating many materials, it was decided to use a Vinylite rigid molding compound. The results have proved satisfactory from every angle. The battery also incorporates new principles requiring unusual package protection. Air must be kept out of the battery, and some moisture must be kept inside until the battery is put to service. This is provided for by a strip of Vinylite sealing tape—supplied by Minnesota Mining & Mfg. Co., St. Paul, Minn.—backed with a vinyl adhesive and applied around the top of the molded vinyl battery case. The tape is

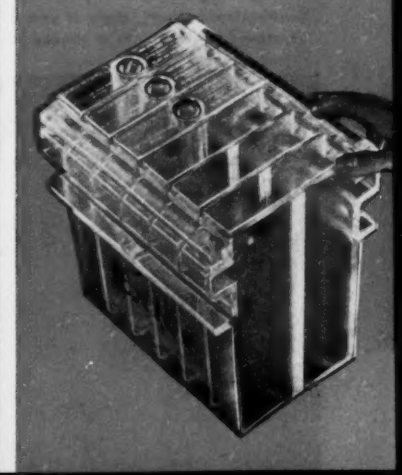
[1] "Hearing Aid Cell Housed in Vinyl," MODERN PLASTICS 26, 84, (Dec. 1948)



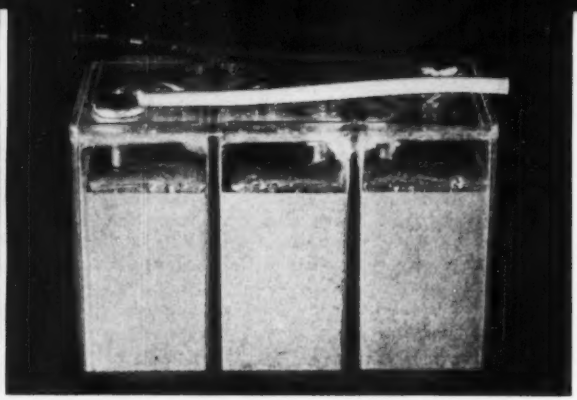


Above: Largest and smallest plastic battery cases. Right: Molded styrene components of case shown above

Styrene case for jet plane battery features more power in less space



Vinyl sealing strip protects hearing aid battery by keeping air out of cell and retaining moisture within the unit until it is ready for use



COURTESY WILLARD STORAGE BATTERY CO

Three-cell battery for special military equipment has its case molded of modified styrene copolymer

stripped off just before the cell is put to use. The use of the vinyl tape, of course, provides a longer shelf life for the battery.

Another use of plastic by National Carbon Co., Inc., New York, N. Y., is in an extruded Vinylite jacket for its Eveready Mini-Max "B" dry battery used in hearing aids and miniature radios. The vinyl jacket, which replaces a paper jacket, gives improved appearance, better moisture retention, and longer shelf life.

Nylon Replaces Steel

One of the most striking uses of plastics in a storage battery case is in a miners' cap-lamp battery case molded of Du Pont nylon. The case is injection molded by Vulcanized Rubber and Plastics Co., Inc., Morrisville, Pa., for Thomas A. Edison, Inc., West Orange, N. J. Replacing stainless steel, the use of nylon was dictated by the requirements of the Edison company. What was wanted was a lamp that would give more light without an increase in weight. In the old lamp, the battery case carried three cells, each of which was insulated by a rubber jacket. The new case, which weighs only 8 oz., carries four cells, and the plastic itself acts as the insulator. It is reported by the Edison company that the new lamp delivers 25% more candle-power without an appreciable increase in total weight of the battery. In addition, the nylon has excellent resistance to the alkali electrolyte and to abrasion.

The nylon battery unit consists of four molded units: the case, the cover, the cover block, and the valve block. The case is molded in a single-cavity mold, and the other parts in a three-cavity combination mold. The use of strong, lightweight nylon has made possible the development of what has been described as the most notable recent advance in underground lighting.

More Power in Less Space

One of the largest and earliest plastic storage battery cases was made by The Electric Storage Battery Co., Philadelphia, Pa. for a 24-volt battery used in jet planes[3]. The battery had to have a container that would permit a ratio of power to cubic content and weight greater than any heretofore possible. Styrene was decided upon as the container material because of its low specific gravity, high acid and electrical resistance, and ability to resist distortion at moderately high temperatures. Styron, Lustrex, and Bakelite styrene are used by the Prolon Plastics Div., Pro-phy-lactic Brush Co., Florence, Mass., to mold the container. The battery, which is capable of producing 15 hp. for 3 min., offers more starting power for less space and weight than other non-spill lead-acid batteries. The non-spill feature is important in aerobatic flying, and the use of plastic parts makes for positive leak-proof construction. Other features of the jet plane plastic case are provision for venting gas auto-

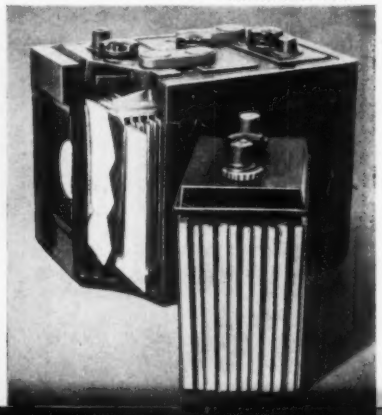
[3] "Industrial and Machinery Award." MODERN PLASTICS 26, 137. (Sept. 1948)

Double retainer mats (made of glass fiber with a plastic resin binder) are inserted around positive plate of storage battery while negative plates are fanned out

COURTESY OWENS-CORNING FIBERGLAS CORP.

Spun-glass retainer mats (white between spacers) are bonded with styrene resin

COURTESY BAKELITE DIV.



Vinyl jacket on hearing-aid unit (left) replaces paper—holds moisture better

matically on charge and discharge, a "no-overflow" device to prevent over-filling, and complete filling and operating instructions molded into the case.

Wafer-Thin Cells

A hearing aid "B" dry battery, which makes use of plastics in a radically different construction, has been announced by the Electrical Div., Olin Industries, Inc., New Haven, Conn. The batteries, which are marketed under the names Bond-Olin and Winchester-Olin, are composed of tiny wafer-thin Tenite II cellulose acetate butyrate cells, which interlock with each other.

The advantages of the butyrate cells, which are molded by the Watertown Mfg. Co., Watertown, Conn., are their dimensional stability and resistance to the corrosive action of the electrolyte. In addition to the interlocking feature, the cells are rectangular in shape because such shape makes maximum use of the total cubic space of a battery pack. It is reported that each individual cell holds more power-producing chemicals with less waste space than in conventional batteries.

The use of the interlocking plastic cells eliminates approximately 91% of the soldered connections which are one major cause of battery failures. The number of cells in each battery depends upon the desired voltage of the assembled battery. The 15-volt "B" battery is made up of one stack of 10 plastic cells; the 30-volt "B" battery contains two stacks of 10 cells each; and the 67½-volt battery contains 45 cells. In the one-stack battery, no soldering is required. Where two or more stacks of cells are used, several soldering operations are still required to join the stacks into one electrical unit. Even then, the number of normal operations is greatly reduced compared to other types of "B" batteries. Due to the method of bonding individual cells into stacks, these batteries are so rigid they can withstand drops of as much as 20 ft. to a concrete sidewalk, without damage.

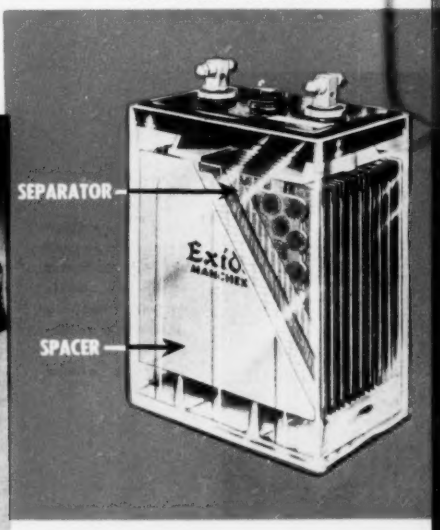
Molded-In Indicator

One of the largest users of plastics for battery cases is Willard Storage Battery Co., Cleveland, Ohio. To date, Willard has six different batteries encased in plastics, some of which have internal parts of plastics as well. The first plastic-encased battery is the Willard storage battery for use in portable radios. The container is molded of Styron styrene by the Plastics Div., General Electric Co., Pittsfield, Mass. Transparency, dimensional stability, and resistance to acid are among the reasons for the selection of styrene. The container has a specific gravity indicator molded-in, thus eliminating the need for testing with the usual bulb hydrometer. Furthermore, the indicator visually shows when the battery needs water. Two other styrene cases for Willard portable radio batteries, molded by The Richardson Co., Melrose Park, Ill., have similar molded-in specific gravity indicators.

Willard uses a Tenite II cellulose acetate butyrate jacket for its 1½-volt Plasticlad radio "A" dry battery. The butyrate jacket, which enhances the appearance of the dry cell, is extruded by Carter Products Corp., Cleveland, Ohio. The extruded tubes are sent to Willard where they are cut to the required size. The jackets are then fed into a machine which inserts the cells into them, crimps the tops and bottoms

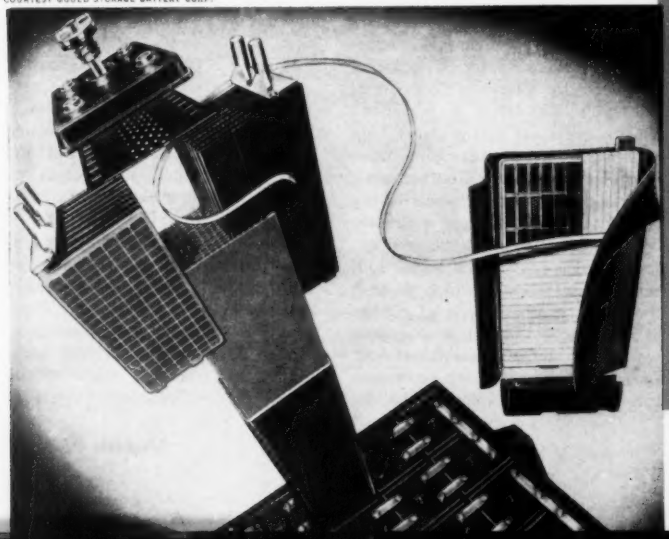
Styrene separators and spacers have acid resistance, impact strength

COURTESY THE ELECTRIC STORAGE BATTERY CO.



Exploded view of storage battery shows perforated vinyl envelope (right) used to hold grid plate and regenerative oxide. Vinyl, which is affixed by heat-sealing, has greater acid-resistance and flexibility than rubber it replaced

COURTESY GOULD STORAGE BATTERY CORP.



Early proximity-fuse battery used phenolic, vinyl, and other plastics

of the jackets, and thus forms the jackets around the cells. The last operation is off-set printing on the jackets.

The fifth Willard plastic battery case is molded by Richardson of Rohm & Haas Plexene, a modified styrene copolymer. Measuring 3⅝ in. long by 1⅞ in. wide by 2⅜ in. high, this unit is a three-cell, six-volt storage battery made for the Armed Forces and designed for use in such special military equipment as guided missiles, rockets, and Azon and Razon radio-controlled bombs.

The sixth Willard battery that uses plastics is composed of three stacks of flat cells, thus eliminating waste space. Fifteen cells are in each stack. Each cell is enclosed in a saran skirt, chosen because of its high strength. The 15 cells are then placed in a cellulose acetate butyrate jacket—extruded in tube form by Carter Products Corp.—a metal clamp is banded around the stack, and the whole stack placed in a styrene container. The container is molded of Dow material by The Colonial Plastics Mfg. Co., Cleveland, Ohio. The styrene holder is in two pieces: the stack is placed in the lower half and the upper half is put on in cap fashion.

SEPARATORS, SPACERS

The Electric Storage Battery Co., maker of Exide batteries, uses styrene for separators, spacers, and nameplates in its new Exide-Manchex storage batteries, employed in many types of stationary power applications. Slotted styrene separators are used in combination with wood separators for insulation between the positive and negative plates. The styrene sheet, which can be slotted more easily and accurately than the non-plastic materials previously used, is non-oxidizing.

The styrene spacers, used because of their high impact strength and resistance to oxidization, are placed between the ribs of the battery case and the oustide negative plate. They perform the double function of serving to keep the outside negative plate in healthier condition and to keep the plates properly aligned in a close, compact assembly.

C & D Batteries uses a glass fiber expansion mat bonded with a styrene emulsion resin. The mat completely envelopes both plate surfaces and provides expansion space. C & D also uses envelope retainers of perforated Koroseal vinyl. The plastic envelope, which is supplied by the Hood Rubber Co., Watertown, Mass., is wrapped around a grid plate and three glass fiber retainers and acts as an insulator.

Battery Life Increased 50%

A new plastic-bonded spun-glass battery retainer mat used for automotive storage batteries is being produced by The Glasfloss Corp., Hicksville, L. I., N. Y. It is claimed that this retainer mat prolongs battery life by as much as 50 percent. The efficiency of the Glasfloss mats is provided by the fiber-reinforcing agent, a Bakelite styrene emulsion. This combination separator and retainer mat is coated on one side with the styrene mixture which gives it the porosity of microporous rubber at a cost about equal to that of a wood separator plus a retainer mat. In addition, the battery manufacturer is saved the expense of buying and installing regular retainer mats.

In durability, the plastic-bonded separator far exceeds those made of wood. The styrene binder, which is non-reactive as well as insoluble in the electrolyte, permits the separators to be made so that they guide battery gases away and retain the oxide in the positive plate, thereby prolonging the life of the battery. In addition, the separators provide ease of handling during assembling.

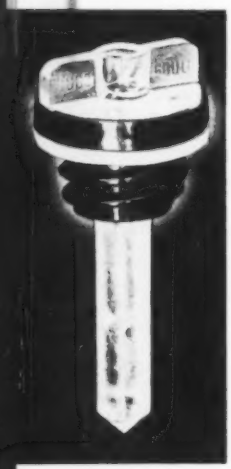
Gould Storage Battery Corp., Trenton, N. J., is also a firm believer in plastics. It has replaced its rubber grid envelopes with Koroseal vinyl. Although rubber is acid resisting, it tends to become brittle over a period of time and in that condition may be attacked by a combination of the acid and lead peroxide in the positive plate. Gould has found no deterioration of the vinyl envelopes. The vinyl envelope is perforated by punch and die at room temperature before it is affixed to the grid plate by a heat-sealing process.

VENT PLUGS

Another use of plastics by Gould is for vent plugs. Known as Televel, these vent plugs are molded of Bakelite transparent styrene by Minnesota Plastics Corp., St. Paul, Minn. Styrene was chosen because of its non-breakability and for its resistance to water and battery acids. The use of the transparent plastic Televel enables battery repairmen to tell at a glance whether or not the battery is in need of water without having to unscrew the plug. The transparent plug has a cylindrical section which projects down into the electrolyte. The portion of the section which extends into the electrolyte is cone-shaped. When the electrolyte is at the correct level; the cone is completely covered. Light waves traveling down the section are absorbed into the electrolyte and not reflected. The top of the plug then shows a black circle, indicating that no water is required. When the electrolyte is low, the cone is not covered and light waves are reflected. When such is the case, a white circle appears showing that water is needed.

Vent plugs on Exide Hycap automotive batteries are made of red

(*Continued on p. 144*)



COURTESY GOULD STORAGE BATTERY CORP.

Vent plug molded of transparent styrene indicates electrolyte levels without requiring unscrewing to determine if more water is needed

Animals Molded For Action

Cellulose acetate animals assembled from small molded parts have free-swivelling joints, can assume a variety of positions

Animal School consists of four articulated animals molded of cellulose acetate and assembled with rubber bands. Package serves as a school house, contains performing platform, ring, and other cardboard accessories

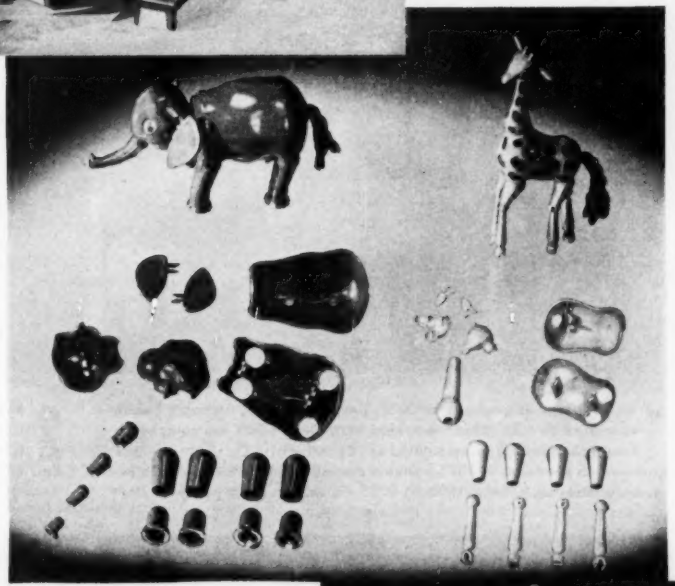
MOLDING simple toy animals is no problem; they can usually be molded in one piece or in two halves and then cemented. But if the animals are to be articulated, there must be many small parts and numerous assembly operations. The problems involved in producing such animals economically have been solved ingeniously by Precision Specialties, Inc., Los Angeles, Calif., producer of Revell Action Animals.

The four animals in the Revell line are Bamboo the elephant, Toppy the giraffe, Zippy the zebra, and Daisy the horse. They are sold individually or in a set known as the Revell Animal School. Each animal is made up of small molded cellulose acetate parts joined together so that the knee, hip, and neck joints are free swivelling. Thus the child can set each animal in a standing position, kicking, running, rearing up on its hind legs, etc. The possibilities are infinite, and the play value of the toys is thus almost unlimited.

Ball and Socket Joints

The free-swivelling joints are ball and socket joints held together by rubber bands. The rubber bands used are designed for use in assembling dolls and are treated so that they have long life and high tear resistance.

In addition to the free-swivelling

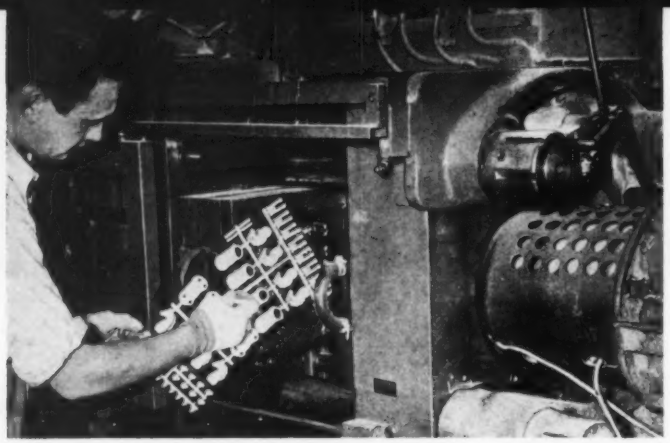


COURTESY HERCULES POWDER CO.

Elephant has 18 cellulose acetate parts, including four-piece trunk. Giraffe has 15 parts. Ears of both animals are molded separately from head and assembled by snap-fit

COURTESY HERCULES POWDER CO.

Horse and zebra are produced in the same mold. The parts are identical, except that horse is molded of brown acetate, zebra is produced of white material



knee, hip, and neck joints, the elephant has a four-piece jointed trunk. The giraffe is jointed at the point where the head meets the neck as well as where the neck meets the body.

The ears of each animal are molded separately from the head and snap-fit into holes in the head in such a manner that they can be "wiggled" or "flapped." Colored hanks of cotton yarn serve as tails.

Parts for four zebras are produced in each shot in 60-cavity die. The other animals are also produced four at a time in multi-cavity dies

MOLDED ANIMALS

1 General view of elephant assembly line. There is one assembly line in operation on each side of the table, both feeding into one paint booth where the eyes are spray-painted on. Operator at rear, right, attaches the ears to the heads of the elephants assembled by both lines. Each assembly line makes from 1500 to 2000 finished animals per 8-hr. shift

2 First step in assembly of elephant is attaching front legs to lower half of body. Threading tool is used to loop rubber band over bar in lower half of leg, thread it through upper half of leg, and draw it tight over pegs molded-in to inside of body

5 Final step in assembly of elephant is cementing the two halves of the body together and, at the same time, inserting the hank of cotton yarn which serves as the animal's tail. Acetone is applied to the two halves of the body, which meet with a lap joint, and they are then put together and placed in a wooden fixture to dry for a few seconds

6 Inspection station on giraffe assembly line. Animals are carefully inspected after final assembly so that rejects can be eliminated before the painting operation, thus saving the time and expense of decorating pieces unsuitable for shipment

The four animals are produced in three molds because the parts for the horse and the zebra are identical, except for the color of the material. The acetate molding powder used is furnished by Gering Products, Inc., and by Tennessee Eastman Corp.

The animals, which are to be sold separately, are sealed in individual cellophane bags. Sketches showing some of the positions which the animal can assume are printed on each bag. The set of four animals is packaged in a box which can be set up as a school house. Cardboard performing platforms, circus ring, chairs, and other accessories are included in the set.

Multi-Cavity Molds Used

The elephant has 18 parts which are produced of gray acetate in a 72-cavity mold by Consolidated Plastic Products Co., Los Angeles. The mold is run on an 8-oz. Fellows-Leominster machine with a 20-oz. Crown pre-plasticizer cylinder. Each shot weighs 14 oz., and the cycle is 100 shots per hour.

The giraffe has 15 molded parts, and is molded of yellow acetate. Precision Specialties produces these parts in a 60-cavity die on an 8-oz. Reed-Prentice machine. The cycle is about 110 shots per hour.

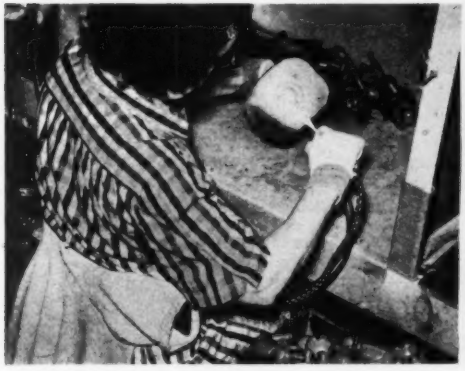
The horse or zebra mold has 60 cavities and is also run by Precision Specialties. Brown acetate is used to mold the parts for the horse, while white material is used to produce the zebra components. A white mane, eyes, and face markings are spray painted on the brown horse, and black stripes are painted on the zebra.

The steps involved in assembling the elephant are shown in the accompanying photographs. The other animals are assembled in the same manner.

—FROM PARTS TO PACKAGES

3 Trunk is assembled to one side of head in same manner as legs are attached to body. Two halves of head are then cemented with acetone (above). Rubber band which will eventually attach head to body is used to hold two halves of head together during cementing. Ears are then snapped on head

4 Back legs are assembled to lower part of body after the complete head and trunk sub-assembly has been attached to the lower half of body. With the help of the specially developed threading tool, the operators soon become quite adept and can assemble the small parts easily and speedily



7 Spray-painting station on the elephant assembly line. Mask is held over the animal's head while white eyes are sprayed on the gray head. In similar operations, brown spots are painted on yellow giraffe, black stripes on zebra, white markings on horse

8 At end of production line, the finished animals are packed in individual cellophane bags cut to fit each animal. Bags are printed in red and white and have sketches showing the various positions the animal can assume. Bags are heat sealed. Animals which are to be sold in sets are packed in cardboard set-up boxes

Solar Stills

PHOTOS COURTESY U. S. FIBER & PLASTICS CORP.

Wading pools made of 20-mil vinyl sheet are silk-screen printed with yellow sidewalls, blue bottom

Separate cells and rounded sides insure safety and stability for inflatable boats

AMONG the fastest growing applications for vinyl sheeting during the past 12 months are inflatable boats, mattresses, wading pools, cushions, beach balls, and similar paraphernalia. True enough, such items have been on the market for several years, but the improved products now available are far superior in every way to those of the earlier days.

As the market expands, new techniques introduced by manufacturers, both old and new, have increased the variety of available products and have improved design, style, and quality to a marked degree. Among the latest lines introduced is that of U. S. Fiber & Plastics Corp., Stirling, N. J., a company that has spent several years in developing a heat-sealing, reinforcing, and handling method built upon experience gained in fabricating the U. S. Navy's new and improved solar still for making sea water potable. The company has spent about $100,000 to tool up for the still and uses 30 machines to manufacture this piece of life-saving equipment for Navy air men who are forced down at sea.

How Solar Still is Made

The still is a 24-inch diameter sphere with two skins—an outer one of 6-mil inflatable-type Vinylite film and an inner skin of black cotton cloth. The two skins are held apart by suspending the black cloth from 32 points at which little round vinyl tabs are welded to the plastic skin. This method of suspension prevents the cloth from touching the plastic when the still is inflated. If the two skins touch at any point, the water would be contaminated with salt.

To operate the still, the drain cloth on the bottom is first thoroughly saturated with water to prevent air from escaping until the bag is inflated either by mouth or pump. The bag is placed overboard and sea water is poured through a molded acrylic funnel from where it drips onto the black evaporator cloth. There is a tube running through the inside of the sphere to fill a ballast tube which, when full of water, holds the sphere upright.

While the still is floating, the sun's rays pass through the vinyl skin and heat the sea water on the black evaporator cloth, causing evaporation. Vapor condenses on the sides of the vinyl cover in little beads which run down to the fresh water trap at the bottom of the sphere. From this trap the fresh water can be drawn off by sucking it through a tube or draining it into a water bag. The salt which remains is washed out through the cloth drain in the bottom. The still can produce more than two pints of fresh water a day.

There are 189 individual parts in the still. Vinyl pieces of 6, 8, 12, 20, and 40 mils thickness are employed. The outer skin is composed of a lower and upper part, each formed of six triangular-shaped parts heat sealed together; the halves are then welded together around the diameter of the globe. Each lot of stills is thoroughly tested before leaving the plant.

Obviously, U. S. Fiber has had to build special equipment and develop new techniques to handle this operation, but the same apparatus together with other machines and the knowledge gained in this precision operation have been employed in the manufacture of a complete line of inflatable consumer items. Each of the company's production units consists of a separate press and high frequency generator hookup. One such combination is a 5000-watt generator with a 74-in. electrode capable of producing a 74-in. straight seal—claimed to be the longest one-shot high-frequency sealing job on record. This and other presses in the plant have jaw tolerances of 0.001 inch.

Testing is Essential

Pin holes and leaky seams must be avoided at all cost by a manufacturer of inflatables. The company has therefore adjusted its equipment developed for testing solar stills to work with its commercial line. In addition, every unit pro-

Lead to Inflatables

duced is inflated, left for several hours, and then carefully inspected for defects before it is allowed to leave the plant.

Among the new types of inflatables by U. S. Fiber are mattresses and cushions with ribbed reinforcements. Thus, instead of sealing the top and bottom together in long depressions, semi-rigid vinyl strips are placed lengthwise at regular intervals inside the cushion or mattress and the top and bottom surfaces are sealed separately to each rib. When the cushion or mattress is in use, the ribs give greater strength to the product without reducing spring or resilience.

Playball of 12-gage vinyl is 18 in. in diameter, comes in many colors

The new cushions and mattresses are recommended not only for water sports, but also for pack trips, outings, fishing expeditions, and for institutions where sanitary mattresses are a prime necessity. All valves consist of either a metal or vinyl tube, depending upon whether or not a soft valve is needed, with a vinyl jacket on the metal tube and a vinyl gasket or washer to which the body of the item can be heat sealed.

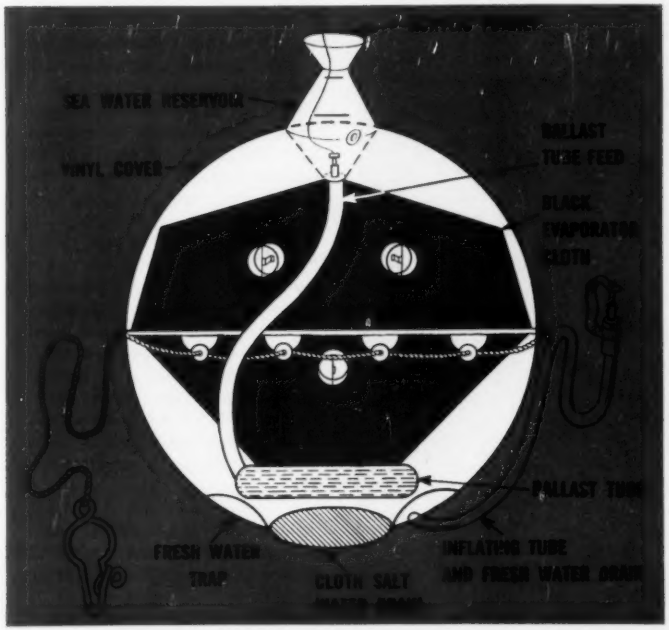
The company's inflatable boats are made so that the flat bottom and the rounded sides are separate cells, each one requiring individual inflation, thus insuring safety and stability. A 25- by 45-in. boat weighs only 3½ lb.; a 36- by 62-in. boat that will hold two adults weighs 6 pounds.

Waders for the particular use of fishermen are another new item for this company. Molded vinyl feet are in this case electronically welded to vinyl pants that can be pulled up beyond the wearer's waist line. Not only do they sell for about 40% of the price of rubber waders, but they do not age or crack.

Beach balls, sea horses, wading pools, and most of the other well known inflatable products are found in this company's line, most of them silk screen printed and produced from 20-mil vinyl sheet.

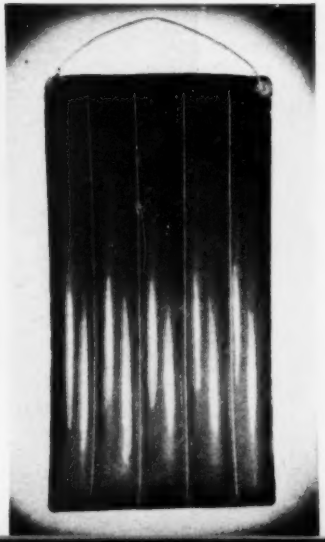
Industrial Possibilities

Manufacturers feel that the market has barely been scratched, but nevertheless fear the advent of scores of new producers and a possible price situation that could result only in quality deterioration. This would be particularly deadly for a product that must depend upon a high quality, air-tight material. Far-seeing executives are therefore searching beyond the toy and play boat purchaser for a market in the industrial field where this same vinyl formulation used for inflatable sheet material can be employed for such things as water- or moisture-proof bags, containers, tubing, and other uses.



Solar still, used to convert salt water to fresh, has outer skin of 6-mil inflatable-type vinyl film, with inner cloth skin suspended by round vinyl tabs

Internal semi-rigid vinyl strips reinforce vinyl surf mat at intervals



Slush Casting Large

Cellulose acetate pieces, cast in inexpensive rubber molds, have intricate designs and can be decorated easily

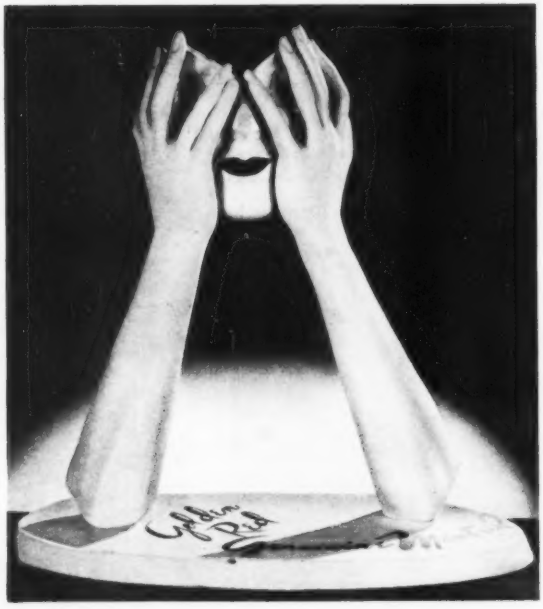
LARGE, rigid, hollow pieces with complicated undercuts, through-holes, and molded-in detail on the outside surfaces are now being produced economically by slush casting Tenite I cellulose acetate in flexible molds. Counter and window display pieces produced by Stonite, New York, N. Y., with this process are successfully competing with such low-cost materials as rubber, plaster, and papier mache.

According to Richard Klopsch of Stonite, the slush-cast acetate pieces can compete with these materials because they offer the buyer a number of advantages at the same or lower cost. Of prime importance is the lustrous finish of the acetate pieces when they are decorated with solvent-type lacquers. The resultant sheen cannot be duplicated in any of the competing materials.

As against plaster, which is extremely brittle, the acetate pieces have the additional advantage of being virtually unbreakable. When they are in competition with rubber, an important advantage is the rigidity of the acetate pieces and elimination of the flabby appearance and feel of rubber.

With the new slush casting process, Stonite has produced a 22-in. high display for Carstairs in the shape of a seal balancing a ball; a 12-in. high white horse statuette as a display for White Horse Scotch; actual-size models of various fruits and vegetables to be used in displays of Philco refrigerators; a statuette of a waiter for Schmidt's beer (Fig. 1); a striking 16-in. high counter display for Germaine Monteil lipstick (Fig. 2); and other similar pieces.

1—Display statuette, slush cast of cellulose acetate, is decorated in many colors. Solvent-type lacquer gives lustrous, chip-proof finish



2—Acetate counter display for lipstick promotion stands 16 in. high

Low Mold Cost

All of these pieces were produced in split rubber molds. The low cost of such molds contributes greatly to the economy of the slush-casting process and makes it suitable for short run or experimental jobs.

The molds are made by spraying and building up a rubber female form on a plaster model of the pieces to be produced. After the rubber has hardened, a two-piece plaster backing is built up on the outside of the rubber mold. Because of the simplicity of this mold-

making process, mold costs for most jobs are likely to be only around $150 to $200.

Casting Process

Because acetate has a tendency to pull away from the rubber mold rather than adhere to it, it is necessary to spray the inside of the mold with a special "sticking agent" before each casting. After receiving this treatment, the mold is put inside the plaster form and is ready for filling.

The casting material is a thick liquid compound prepared by Stonite by adding suitable plasticizers to Tenite I injection molding powder. The liquid compound is kept in a vat at about 400° F. and is kept in constant circulation through a pipe with a swivel joint. Except when a mold is being filled, the circulating liquid feeds from the pipe back into the vat.

To fill the mold, the operator swings the pipe out from above the vat and holds the mold under it until it is full (Fig. 3). As soon as the mold is full, the operator turns it over and pours most of the liquid back into the vat. However, in the meantime, that portion of the liquid which has contacted the cool mold has cured sufficiently to remain in the mold.

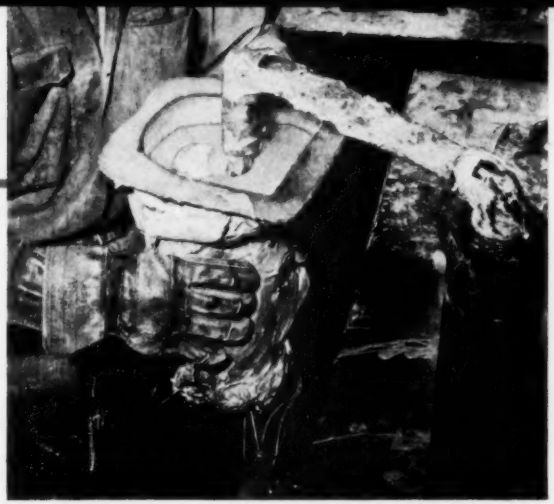
To complete the cure of the shell which remains in the mold after the excess compound is poured out, the mold is filled with water at room temperature, and allowed to set for a few minutes. The water is then poured out (Fig. 4).

To release the piece from the mold, the operator merely removes the two-part plaster backing and peels the split rubber mold from the finished casting (Fig. 5).

Method of Finishing

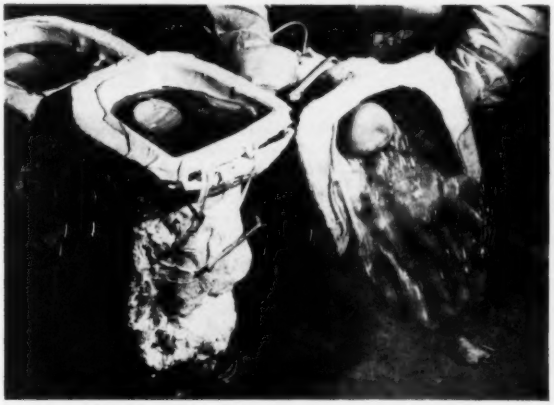
After removal from the mold, the casting is sanded to eliminate flash and evidence of the parting line. It is then given an acetone bath to smooth the surface, and is ready for decorating.

In the case of the Schmidt's dis-



PHOTOS ON THIS PAGE COURTESY TENNESSEE EASTMAN CORP.

3—Pipe on swivel joint is swung out from above vat to feed liquid casting material to the mold. Compound is kept circulating at about 400° F.



4—Cure of shell remaining in mold is completed by filling mold with water, allowing to set for a few minutes, and then pouring out water

5—To release acetate display piece from mold, two-part plaster backing is removed and the split rubber mold is peeled from the finished casting

PHOTOS COURTESY TENNESSEE EASTMAN CORP.

6—In lacquering, large areas of statuette are sprayed; pieces cut from rubber molds are used to mask adjacent surfaces

7—Details of slush-cast acetate display piece—such as facial features and hoops on the barrel—have color applied by hand

play which is shown in the accompanying pictures of the casting and decorating operations, the colors involved are white, gold, silver, dark brown, reddish brown, flesh color, gray, and blue. Large areas, such as the waiter's coat and pants, are sprayed, and pieces cut from rubber molds for the part are used to mask adjacent areas (Fig. 6). The details, such as the facial features and the hoops on the barrel, are hand painted (Fig. 7).

The lacquer used is supplied by United Lacquer Mfg. Corp., Linden, N. J. It is a solvent-type lacquer which smooths the surface of the casting while it is being applied and produces a chip-proof finish.

8—Applications of slush-casting process include 18-in. high figures which can be used as lamp base or decoration

Future Possibilities

In addition to the display field, in which the new Stonite process has already proved itself, there seem to be many other applications for which slush-cast acetate pieces can be used. For example, Stonite is now producing 18-in. high Chinese figures (Fig. 8) which can compete with similar pottery pieces for use as lamp bases or when used alone for decoration.

The adaptability of the process for producing large pieces should recommend it for other applications. The Carstairs seal weighs about 2½ lb. and the Schmidt's display weighs over one pound. On an experimental basis, Stonite has produced the bottom half of a life-size mannequin in one piece.

In addition, the low mold cost may make the process useful for producing samples to market test a product designed for injection molding in full scale production.

Versatile Display Boards

CHANGEABLE letter display boards of various sizes can be built up with extruded styrene channels which are designed to interlock with one another. The channels hold letters and characters silk screened on rigid vinyl squares. The new composition display boards, which are made by Dojama Eastern Corp., Gordonsville, Va., are suitable for such things as building directories, menu boards, schedule boards, price boards, church hymnal boards, etc.

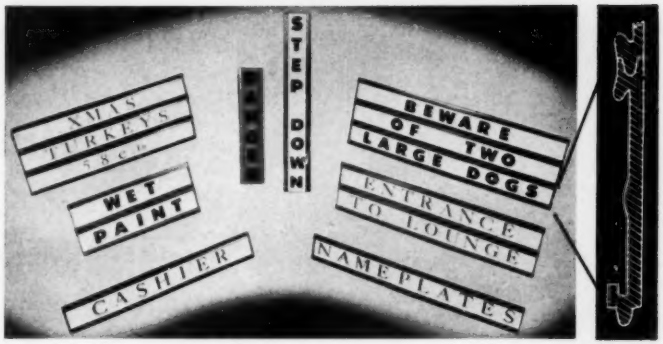
The channels which make up the display boards are extruded of red, black, or white Styron by the Plastics Div., General Electric Co., Pittsfield, Mass. A tongue on one side of the channel and a groove on the other permit combining the channels to make boards just as tongue-and-groove lumber is joined to make a floor.

The channels are cemented to one another and reinforced by bonding extra sections of the channel to the back of the assembled board at right angles to the direction of the channels which make up the board. Dojama manufactures boards in any size from one channel 2 in. long to any number of channels measuring 48 in. long.

The boards are available with easels, with metal hangers, or with adhesive hangers for permanent bonding to any wall surface. A mounting plate is also made which consists of a vinyl strip bonded to sponge rubber which is in turn bonded to the wall. The strip slides into one of the standard channels which is bonded to the back of the board. Thus the board can easily be removed when changes in copy are required.

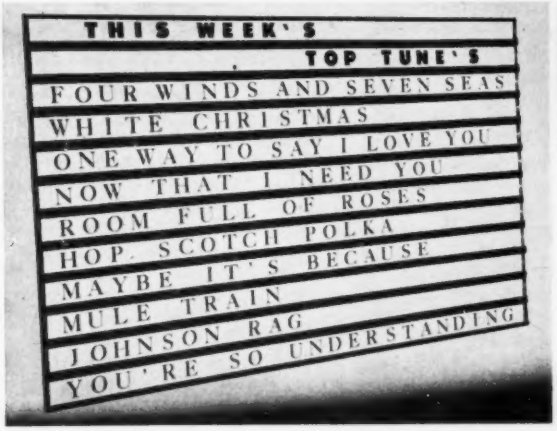
The letters and characters are silk screened on 0.020-in. thick rigid vinyl sheet and shear cut to size (0.980 in. square) with specially modified metal cutting shears. Characters are produced in fine or bold type in over 30 color combinations. Arrows, stars, fractions, punctuation marks, and other symbols as well as letters and numbers are available. Blanks and half-blanks in various colors are used for spacing and for the arrangement of decorative patterns.

The characters are packed in sets of 100 in cardboard fonts with 42 compartments or in sets of 350 in transparent styrene fonts molded by Vlchek Tool Co., Cleveland, Ohio.

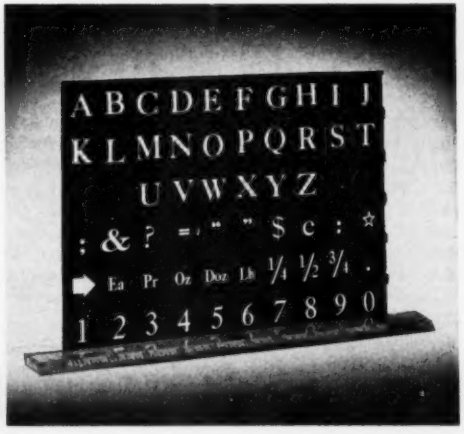


New plastic display boards are suitable for many uses. Channels which make up signs (right) are extruded of styrene, have interlocking tongues and grooves

Boards are formed by cementing channels together—can be easily removed for copy changes. Available lengths range from 2 to 48 inches



Letters and symbols, silk screened on rigid vinyl sheet, come in fine or bold type in over 30 color combinations



Close-up of a section of the main display at the recent plastics exhibit showing before-and-after case histories

At the 4th National Plastics Exposition

THE theme of the Fourth National Plastics Exposition, which was held in Chicago March 28 through 31, was "Plastics Build Better Products and Better Values."

Hundreds of applications to prove the point were shown in the largest single exhibit at the show—the theme exhibit sponsored by the Society of the Plastics Industry. This exhibit consisted of before-and-after samples of products which were improved by or made possible through the use of plastics. Many of the case histories presented in the January and April, 1950, issues of MODERN PLASTICS were shown.

Many companies built their exhibits around variations of the exposition's theme. Durez, for example, showed many before-and-after samples of products which had converted to plastics. American Cyanamid, in a pre-show promotion letter, invited the recipient to see how the company's materials "can be used to build better products and better values for your company." Monsanto showed case histories of companies which had overcome "habititis" (the tendency to resist change) and improved their products with plastics.

In keeping with the theme, the main emphasis of most of the exhibits were upon solid, proved applications and materials—rather than on the new and novel. The MODERN PLASTICS editorial team surveying the exhibits found comparatively few materials, machines, and applications which had not previously been reported in these pages.

Progress Since 1948

This is not to say that there were no signs of progress. On the contrary, the industry had obviously made tremendous strides since the Third National Plastics Exposition in New York in 1948. For example, the 40-lb. phenolic molding (produced two at a time in a two-cavity die) shown at Chicago this March by Molded Products Corp. would have been considered miraculous in the fall of 1948. This year the piece attracted attention, but surprised nobody.[1]

[1] The piece, an Admiral television cabinet, was reported in "Television Cabinets Grow Larger," MODERN PLASTICS 27, 118 (April 1950).

Another indication of progress was the fact that the materials which were introduced in New York in 1948 were represented by numerous applications at Chicago in 1950. The heat-resistant styrenes, Koppers' P-8 and Dow's Styron 475, were new at the Third National Plastics Exposition. At the Fourth N.P.E., there were so many applications of these and other heat-resistant styrenes that it would have been difficult to count them.

Similarly, there were many applications of flame-resistant cellulose acetates, which were relatively new materials in 1948. Large acrylic sheets (100 by 120 in.) were news at the Third N.P.E.; large signs made of acrylic were commonplace by the time of 1950's show.

Plaskon's alkyd molding compound, shown for the first time at the Third N.P.E., was represented at the recent Chicago show by a number of successful applications. Presses made by three different manufacturers specifically to mold this material were also shown.

In addition to these and other signs of progress to date, there were enough new materials to prove that the industry is too busy looking to the future to spend any time resting on its laurels.

New Materials

Foundry resin. Bakelite announced a new phenolic resin for use in the Croning Process of producing foundry castings. The process uses a resin binder to produce cores and molds from sand without long baking and curing, and is said to result in improved quality of castings, improved working conditions in the foundry, a reduction in the amount of manual labor needed, and lower cost.

Styrene-loaded glass mat. Monsanto and Owens-Corning Fiberglas announced the development of a thermoplastic structural material made up of glass mat loaded with a styrene latex. The new material can be molded in compression presses on a short cycle with the type of steel dies used for phenolic or melamine laminates. Finished items are said to have all the advantages of molded styrene plus greatly improved strength.

Improved phenolic resins. In addition to the new foundry resin, Bakelite announced its C-22 fast-curing general purpose phenolics. These molding materials, according to the manufacturer, have curing rates 15 to 45% faster than phenolics which have previously been rated as fast curing, and produce high gloss pieces with excellent mold release.

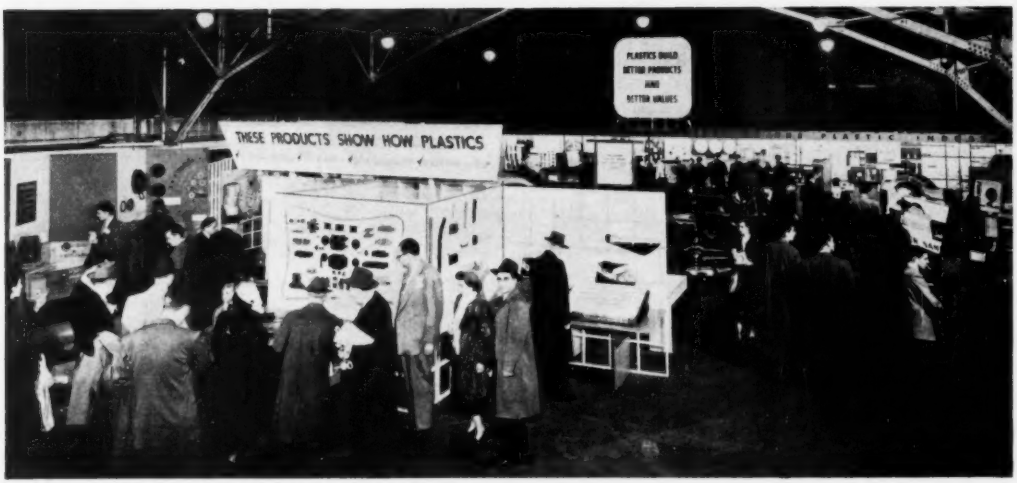
Two new phenolics were announced by Durez. One is a mineral-filled molding compound (Durez 14893 Black) with unusual heat resistance. The material is said to withstand intermittent exposure to temperatures up to 500° F. or 200 hr. of continuous exposure to 450° F. The second compound announced by Durez is formulated specifically as an insulation coating for electrical parts. This resin (Durez 9841) is supplied in powdered form and is a mixture of phenol-formaldehyde resin and an inert filler.

Three new Hycar-phenolic molding compounds (an asbestos-filled, a cotton flock-filled, and a fabric-filled compound) were announced by General Electric. These materials are said to extend the range of impact resistance for thermosetting molding compounds.

Urea coating resin. An improved heat-convertible butylated urea-formaldehyde surface coating resin was announced by Monsanto. The new resin (Resimene U-901) is recommended in both topcoats and undercoats for metal finishing and is said to give the industry a fast-curing resin with high gloss and exceptional freedom from undesirable cure pattern.

Two vinyls and a plasticizer. Three new materials were announced by Goodrich: 1) a polyvinyl chloride resin (Geon 400 x 65) for rigid molding; 2) a vinyl vinylidene chloride copolymer resin (Geon 200 x 20) which offers economies in the field of solution-applied coatings; and 3) an odorless dioctyl adipate plasticizer (GP 233) which is particularly useful when applied in

General view of the principal theme exhibit—largest single display at the recent Fourth National Plastics Exposition



organosol and plastisol formulations.

Kel-F dispersions. Kellogg announced the availability of the first two of a series of Kel-F (trifluorochloroethylene) dispersions which permit the application of Kel-F to materials and equipment not amenable to processing by molding.

Silicone-glass compound. The first commercially available silicone molding compound, a combination of silicone resin and a glass fiber filler, was shown by General Electric. The compound (G-E 12810) has high impact resistance, excellent arc resistance, and will withstand continuous operation at 392° F.

New Applications

The applications on display were so numerous that only a few of the newer and more unusual applications can be noted here.

Much interest was shown in Versibond, a flexible decorative high pressure laminate introduced by The Ohio Rubber Co., Willoughby, Ohio. The new decorative material consists of a melamine laminate bonded to a sheet of rubber. It can be bonded to various surfaces, including curved surfaces, with contact pressure. It is said to have all the decorative and wearing qualities of other cigarette-proof melamine laminates.

Decorative melamine laminates were much in evidence, and the stability and importance of this application were attested to by the displays of some of the producers of this material. Westinghouse, for example, had an elaborate display of the use of Micarta for wall surfaces, work surfaces, bar tops, etc., in the home as well as in commercial installations. It was announced that Micarta laminates already bonded to plywood cores are now being distributed by U. S. Plywood through retail lumber dealers.

Among the interesting applications of polyethylene on display were some large pails, containers, and large-diameter pipes. These items, fabricated by American Agile Corp., were displayed by Du Pont.

One of the newest reinforced polyester moldings shown was the motor cover, or shroud, for an Elgin outboard motor. This piece, made by General Electric, is said to muffle engine noise and to be more durable than metal shrouds.

Lumite Div., Chicopee Mfg. Corp., was showing new decorative fabrics woven of saran and designed for use on upholstered interior furniture.

(*Continued on p.* 146)

COURTESY OMNI PRODUCTS CORP.

The International Luncheon. Top row, left to right; John Wetherby, Society of the Plastics Industry, Inc.; James Dukes, Tennessee Eastman Corp.; C. E. Brocklebank, Bakelite Div., Union Carbide and Carbon Corp.; Winthrop Brown, U. S. Dept. of State; Tino Perutz, Omni Products Corp.; F. E. Moran, Monsanto Chemical Co.; Frank Gehrig, Celanese Corp. of America; Howard Ball, The Dow Chemical Co. Bottom row, left to right: Carlos Kalusin, Kalusin Importing Co., Barranquilla, Colombia; L. P. Jensen, L. J. Herman & Co., Melbourne, Australia (Australian Plastics Federation); Francisco Masjuan, ATMA S.A., Buenos Aires, Argentina; J. E. Sisson, Imperial Chemical Industries, Ltd., Welwyn Garden City, Herts., Eng. (British Plastics Federation); Fermin Fulda, Cia. Industriel Importadora, Mexico, D. F.; Claude Magnen, M.I.O.M., Vitry sur Seine, France; Carl-Erik Dahlgren, AB Plastikmanufaktur, Vadstena, Sweden; Ichibei Yonezawa, Omni Products Corp., Tokyo, Japan; Fritz Jacob, Muller & Cia., Sao Paulo, Brazil; M. Klafter, N. V. Negum Metaalwarenfabriek en Bondvlechtern, DeBilt, Holland

Acetate Makes Better Targets

PHOTOS COURTESY HERCULES POWDER CO.

Shooting gallery target of cellulose acetate has red housing molded in two parts. Back of housing is curved to trap shots for re-use. Seven spinning targets are white to show up against dark backdrop

IN its search for a more effective package for its low velocity air pistol, Daisy Mfg. Co., Plymouth, Mich., turned to plastics. The end result, the Daisy Targette, is not only an effective package but a new and better product.

The chrome-plated Daisy Air Pistol shoots small-size BB's accurately up to a range of 12 ft. but, because of its low velocity, can be used safely indoors without injuring bystanders or room furnishings. The pistol was originally packed flat in a simple cardboard box. The lid of the box could be propped open to form a backdrop for three metal targets which spun on a wire mounted in holes in the side flap of the lid. The service life of this container was limited, and it had little sales appeal when displayed on store counters.

The new Targette, molded of cellulose acetate, was designed by Sundberg-Ferar as a part of the design service offered by Hercules Powder Co. to users of cellulosic plastics. It has a housing molded of dark red acetate in two parts. The seven spinning targets are molded of white material so that they show up clearly against the dark housing. All parts are molded of Hercules cellulose acetate by Modern Plastics Corp., Benton Harbor, Mich.

Curved Housing Traps Shot

The back of the housing is curved so that shots which enter through the front openings are trapped inside and can easily be recovered for re-use. A round metal container of 400 BB's can be stored in each of the two hollow legs of the target.

The pistol itself fits into a slot in the top of the target for display or storage.

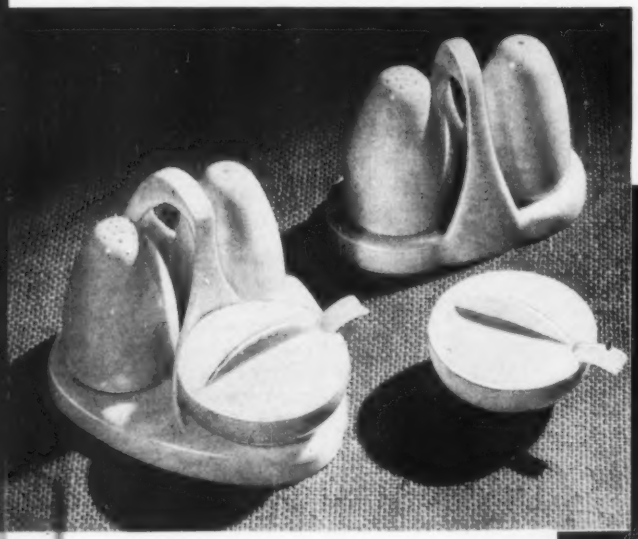
The seven spinning targets are mounted at the point where the two halves of the housing are joined. Each target is mounted individually so that only the one which is struck will spin each time a hit is scored. The mounting holes are off center so that the targets come to rest in a vertical position when they stop spinning and are thus ready for the next shot without any resetting.

The acetate targets and housing are tough enough to take continuous hits, even at close range, without being damaged. However, the lubricant used on the pistol pellets leaves a mark on the white targets which testifies to the exact location of each hit. The marks can easily be rubbed off after being scored.

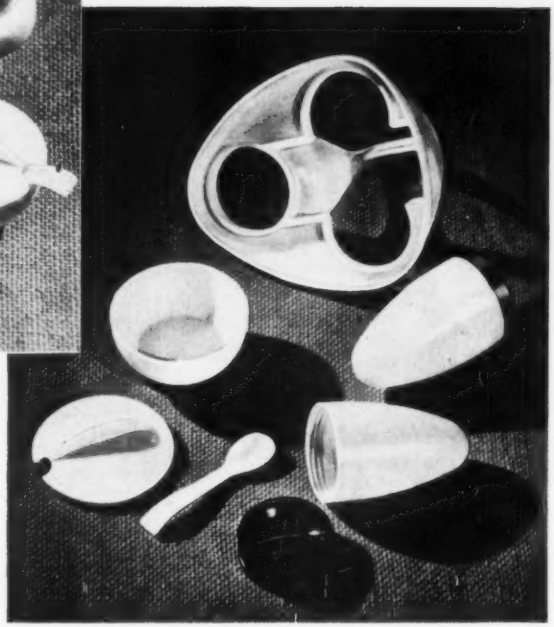
Pistol was originally packed in flat cardboard box whose lid could be propped open for target background

Slot in top of plastic target holds pistol for display or storage. Hollow legs each hold an ammunition carton

Progress in



New urea condiment set comes as combined unit of salt and pepper shakers and mustard pot with spoon, all in holder (left) or as pepper-salt unit in holder with pot separate (right)



Simplicity features molding detail in parts of three-piece urea condiment set. Recessed black base has flange to provide easy finger hold for unscrewing from salt and pepper shakers

THERE are not many consumer items made of plastic which can be said to have been introduced 20 years ago and to have been selling consistently well ever since. One such application is Beetleware, the molded urea tableware which has been popular in Britain since 1930 and which was recently redesigned.

Beetleware is molded from urea formaldehyde molding powder by The Streetly Mfg. Co., Ltd., Sutton Coldfield (near Birmingham), England. It is molded in four standard colors: ivory, orange, green, and blue with material furnished by The Beetle Products Co., Ltd.

Original Design Angular

When Beetleware was first introduced in 1930, the design was angular, featuring numerous sharp corners, ridges, and knife edges. This design remained basically unchanged, pre-war, although minor changes and improvements were made from time to time. For example, the original cups were once redesigned so that they would nest easily. However, the same general lines and the rather angular handle were retained.

Curves in New Design

When the producer resumed production after the six-year war interruption, it was decided to redesign the set to bring it in line with current trends. In the final new design, the angularity has given way to gentle, pleasing curves and the ridges have been eliminated in favor of plain, unbroken surfaces which display the colorful, lustrous surface of the urea material to maximum advantage. The cup, for example, was completely redesigned and given a more compact, more practical handle. The nesting feature was retained.

In some of the pieces, such as the beakers shown in an accompanying photograph, curves have been employed to give the illusion of a bulge in the forming of the walls although there is a taper from lip to base.

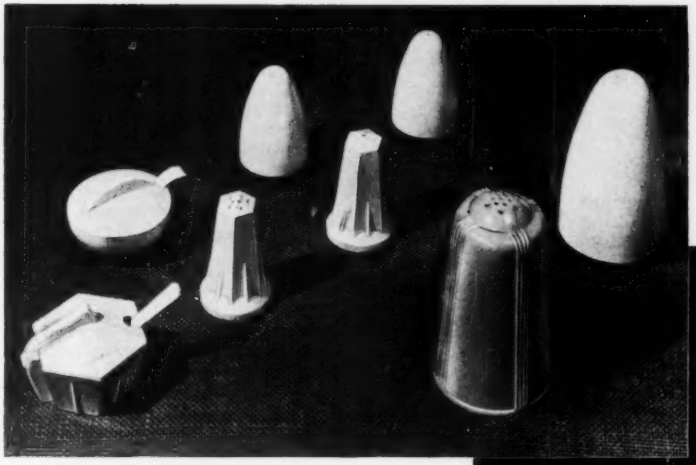
Diversified Line

The Beetleware line now includes soup plates, meat plates, side plates, cereal dishes, four sizes of trays, mugs, napkin rings, and condiment sets, as well as assorted kitchen items such as containers and funnels.

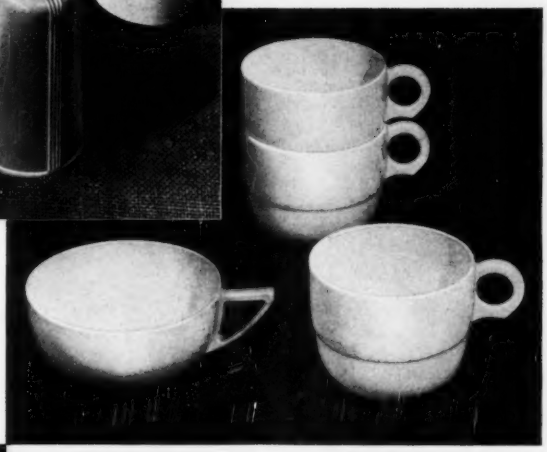
One of the most recent additions to the line is the three-piece condiment set with holder. As a result of the addition of this item, Beetleware condiment items (salt shaker, pepper shaker, and mustard pot with spoon) are now available either separately, as a pepper and salt unit with holder and separate mustard pot, or with all of the items combined in one unit.

British Urea Tableware

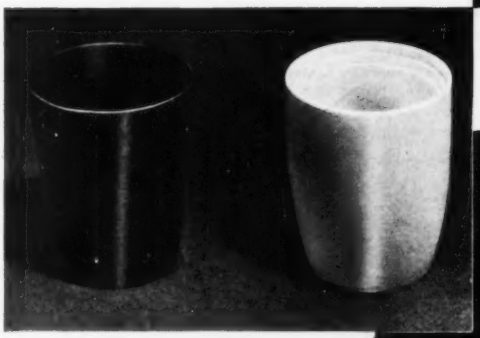
Popular household items, entering third decade, undergo streamlined redesigning



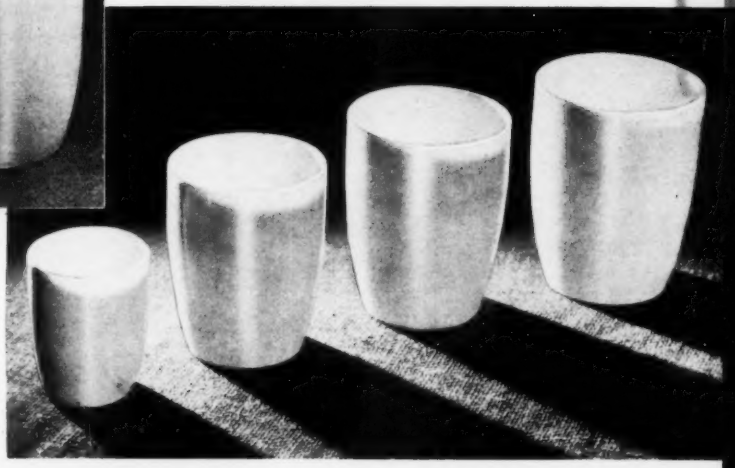
Left: Comparison of old and new urea tableware. Knife edges and ridges on earlier designs have given way to curved unbroken surfaces which take maximum advantage of urea's luster



Right: Evolution of urea cup. Original, left, characterized by angular lines, was revised to permit nesting. Latest style, right, is redesigned with more compact handle. Two cups nested in rear illustrate firm stacking



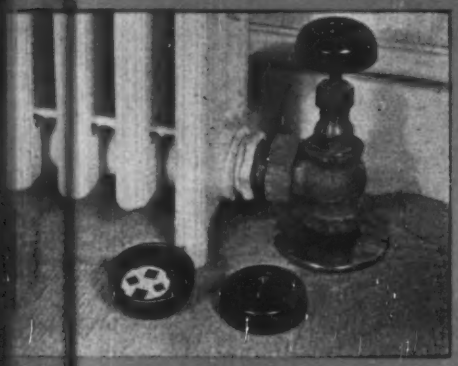
Left: Urea beaker at left is pre-war. Group of newest units at right has three beakers nested, with smallest one inside



Right: Redesigned urea beakers. Although graceful lines convey bulging impression, taper is maintained from lip to base. Three larger-size models nest one within the other for compact stowage while the smaller one, which measures 2⅜ in. high, is dropped into bottom

Plastics

Left: Inflatable lounge chair made of Vinylite film weighs only about 2 lb. and can be tucked into a beach bag when deflated. When inflated, chair has an 18- by 19-in. seat cushion and a 16- by 19-in. back rest. Built-in compartment in the back rest serves as a storage place for cigarettes, books, etc., Made by Plastictronics, Inc., 54 Greene St., New York, N. Y.



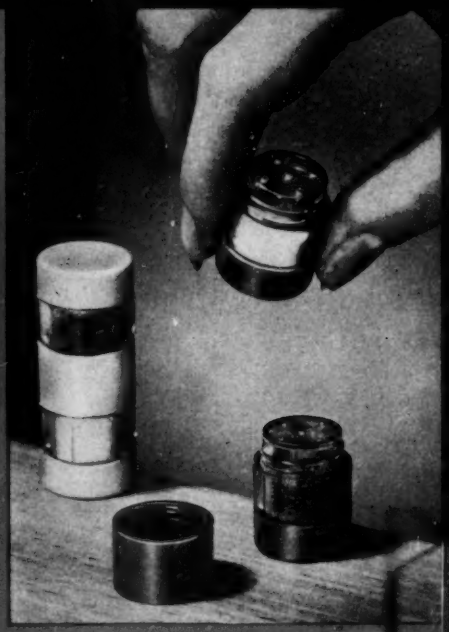
Left: Radiator handle made of heat-resistant Resinox phenolic is designed to fit any of the four most common sizes of valve stems. Steel plate in the bottom of the handle has four openings and can be turned so that the proper opening is in the center of the handle. The handle is attractive, easy to keep clean, and is always cool to the touch. The phenolic handles are manufactured by Diemolding Corp., Canastota, N.Y.

Below: Coating of Tenite II cellulose acetate butyrate extruded over steel makes lawn coasters colorful, rust-proof, and corrosion proof. Pointed ends of the stakes can be stuck in the ground at any convenient spot while the spiral top holds a glass. Made by Karolle Industries, Ltd., 230 Fifth Ave., New York, N. Y. The coated steel rod is made by Samuel Moore & Co., Mantua, Ohio

Above: A completely different type of clothespin, called the Jiffy-Grip, is molded of Lumarith cellulose acetate. Finger pressure on the "trigger" opens the pin so that it slips on easily. The resilience of the material causes it to snap shut. Belmar Products, Box 36, Leominster, Mass.

Products

Above: Humpty Dumpty puzzle is made up of six pieces molded of styrene. The six pieces interlock in such a manner that they can be taken apart or assembled only in a certain order. Puzzle is made by Helenhart Novelty Corp., 171 Madison Ave., New York, N.Y. Parts are molded by Newburgh Plastics Corp., Newburgh, N. Y.



Above: Leak-proof salt and pepper shakers for lunch box or picnic basket are molded of Tenite I cellulose acetate. Both shakers fill from the bottom and screw in to either end of a middle section which serves as a closure. Molded by Sinko Mfg. & Tool Co., 2947 N. Oakley Ave., Chicago, for Toto-Brush, Inc., 2411 Clybourn Ave., Chicago

Below: Sink strainer molded of polyethylene has hole pattern designed so that strainer does not drip if tilted back slightly while being carried from sink to garbage can. Bottom has reinforcing ribs molded-in for added strength. Strainer is molded by B W Molded Plastics, 1346 E. Walnut St., Pasadena 4, Calif.

Above: Proper markings for turning cuffs on trouser legs can be made with a minimum of measuring by using marking guide made of Vinylite transparent rigid sheet. Once marker is in position, lines can be drawn to indicate where material should be cut, and where stitched and turned. The cuff marking guide is made by Plastic Products Development Co., Box 85, Sweetser, Ind.

Plastics

Above: Cellulose acetate butyrate is used to mold the three-part body of the sturdy Roy Rogers camera made by Herbert George Co., 211 N. Desplaines St., Chicago. Plastic parts are molded by Superior Plastics Div., Commonwealth Plastics, Inc., 426 N. Oakley Blvd., Chicago

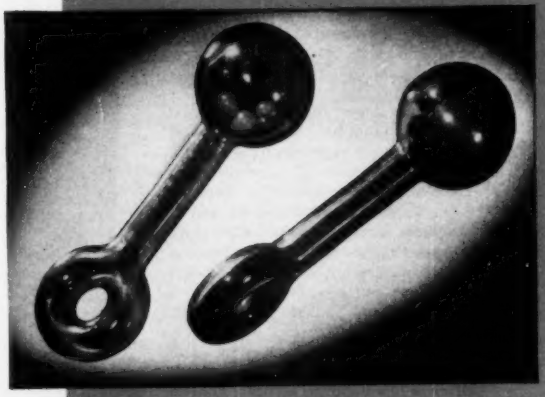
Above: Practice golf ball made of Bakelite polyethylene clicks when hit, has same line of flight as normal golf ball, but travels only one tenth the normal distance. The ball is molded in two halves which are bonded to each other on a special machine designed by the manufacturer, Cosom Industries, 3520 E. 43rd St., Minneapolis 6, Minn.

Above: Bottle cap for resealing carbonated beverages has three plastic parts. Split piece is molded of Plaxone styrene copolymer; other pieces are polystyrene. Designed by Gerald Johnson and made by Vulcanized Rubber & Plastics Co., 221 Fifth Ave., New York, N. Y.

Below: Coffee dispenser which fits onto standard one-pound tins is molded of transparent amber-colored styrene in three pieces. The rotating valve measures out exactly one tablespoon full of coffee with each quarter turn. Made by Serva-Matic Industries, Inc., 556 W. Fulton St., Chicago 6, Ill.

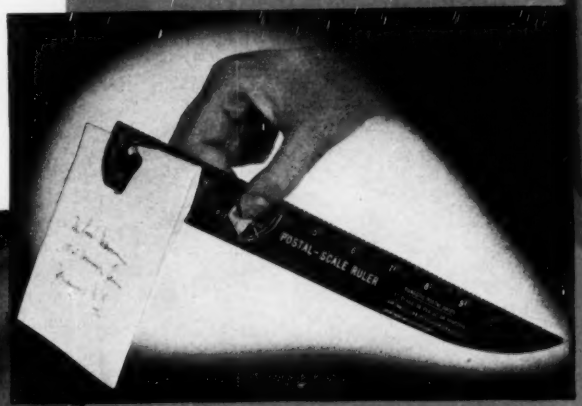
Products

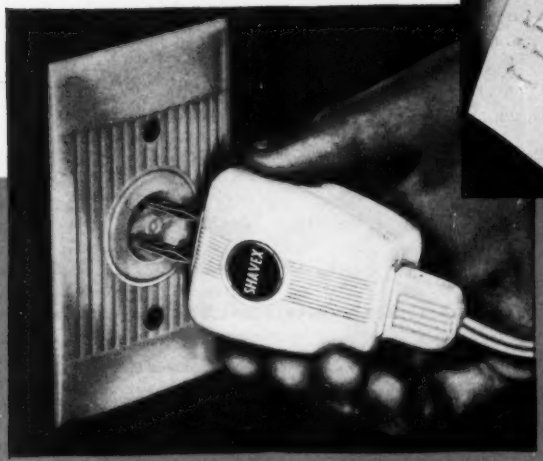
Right: Flower beds can be thoroughly soaked without washing away the soil with the use of the Iri-gator, which screws on to the end of the hose. The top and bottom of the housing and three internal baffles which break up the stream of water are molded of Durez phenolic. The strength, water resistance, and economy of phenolic dictated its choice for this application. Made by Thomas Mfg. Co., Tucson, Ariz.



Right: Baby rattle is molded in two parts, one transparent and one opaque, of Hercules cellulose acetate. Transparency of one half enables the baby to see, as well as hear, the colored beads inside which roll from one end of the rattle to the other. The acetate parts are molded by Franklin Plastics Div., Robinson Industries, Inc., 318 Atlantic Ave., Franklin, Pa. Holgate Bros. Co., Kane, Pa. makes the rattle

Below: Efficiency of electric shavers is said to be improved as much as 80% with the use of the Shavex, which transforms alternating current to direct current. The housing of the Shavex is molded of Beetle urea by Reinhold-Geiger Plastics, 8763 Crocker St., Los Angeles, Calif. The Shavex is made by Electronic Specialty Co., 3456 Glendale Blvd., Los Angeles





Above: The amount of postage needed for a letter can be determined quickly with the Postal Scale Ruler, which works on the simple principle of the lever. The ruler, which is molded of Lustrex styrene, also serves as a letter opener. Made by Optim Products, Inc., 376 Broadway, New York 12, N. Y.

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PLASTICS ENGINEERING*

F. B. Stanley, Engineering Editor

Flame Spraying of Polyethylene

by DR. J. A. NEUMANN†

POLYETHYLENE is inert to most gases and chemicals, resistant to moisture, and has outstanding electrical properties. It is insoluble at temperatures below 70° C. and for this reason can not be dissolved and applied as a paint film. Stable emulsions do not give good results in producing coatings. However, satisfactory coatings can be obtained by low temperature flame spraying.

Polyethylene has a short softening range—between 100 and 115° C. —and a sharp melting point which is of great help in the flame-spraying process. The gun developed for flame spraying was designed around these characteristics of the material. The process was perfected by close collaboration between Messrs. De Long and Peterson of E. I. du Pont de Nemours & Co., Inc. and American Agile Corp. Tests have shown that continuous coatings can be produced which are smooth in appearance, uniform in thickness, and exceedingly well bonded to the target.

All tests have shown that flame-sprayed polyethylene has the same physical characteristics (Table I) and resistance to chemical attack (Table II) as molded or extruded material.

Surface Preparation

The adhesion of flame-sprayed polyethylene film to metallic surfaces depends on the surface of the target being clean and uniformly roughened. In small areas, the metal can be prepared with an emery disk. Larger areas should be sand- or shot-blasted. It is desirable that the roughening of the surface should be not too coarse and not too fine, depending upon the requirements of adhesion.

After cleaning, the surface should be preheated. This can be done, with smaller pieces, in an oven with a temperature of 400° F. Preheating can also be done with the flame-spraying gun adjusted to produce a neutral flame about 3 in. long. This is achieved by opening a by-pass in the gun and admitting excess air pressure to the flame. The flame will then resemble that of a Bunsen burner. With the gun so adjusted, polyethylene is not drawn into the flame. The temperature of the surface to be coated can be determined by thermo-couples or by the use of Tempil-sticks or Tempilac.

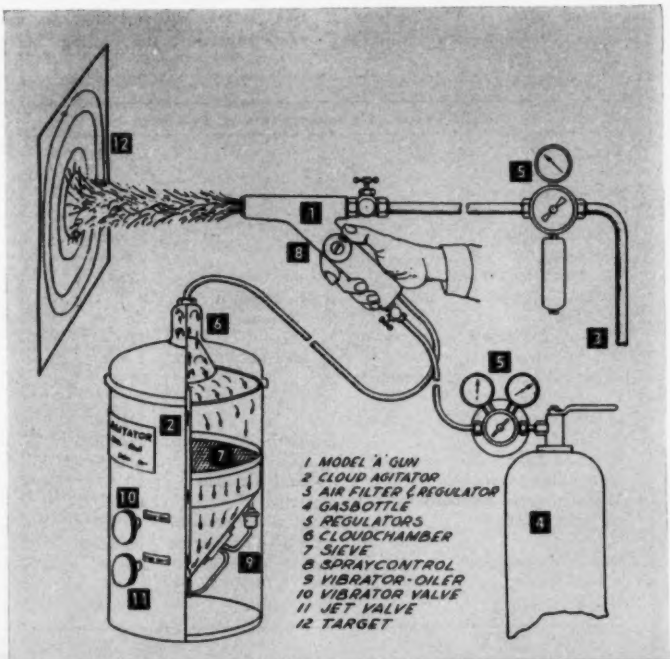
Approximately one square foot should be preheated at a time so that heat dissipation can be balanced during the spraying process. By this means, continuous operation can be achieved. With heavier sections, a second burner is advisable, working simultaneously with the first; when possible, the second gun should be worked from the other side of the target.

Spraying Operation

One of the most important factors in flame spraying of polyethylene is a dependable and constant powder supply. For this reason, powder feeders have been developed to make possible a uniform flow of the air-powder mixture. The diagram in Fig. 1 shows how this is accomplished in a simple and reliable way.

The powder is placed in a funnel-

1—Flame-spraying gun and associated equipment. Uniform flow of air-powder mixture to the gun is provided by the special feeder shown at lower left



* Reg. U. S. Pat. Office.
† Director of Research, American Agile Corp., Cleveland, Ohio.

2—Low temperature flame-spraying gun for applying polyethylene

shaped receptacle which is agitated by an air-driven vibrator. The powder particles are then carried by air to a cloud chamber in the top of the powder supply unit. The cloud chamber is transparent, permitting the operator to observe the air-powder mixture and correctly adjust the jet valve. From the cloud chamber the powder and air are drawn by suction through a flexible hose to the gun (Fig. 2) which shoots it through the flame to the target.

It is important that the particles should be small and uniform in size; large particles will tend to clog the powder line. Powders with spherical particles are preferable to flat or flakey powders, because spherical particles have a tendency to settle more evenly on the target and are not blown away due to air turbulance. The carrying passages must be smooth and free from frictional resistance.

Flame Structure

The preheating flame has been explained previously. By closing the bypass in the gun, the amount of air fed to the flame is reduced and the flame is therefore lengthened. This air adjustment should be made so that the length of the flame becomes about 24 inches. The temperature of the longer flame will be markedly lower than that used for pre-heating. Another result of the bypass adjustment is to create suction in the flexible hose connecting the gun and the cloud chamber. This suction will draw the flame-spray powder from the supply unit to the gun. The powder partially melts on its way through the flame to the target, and complete melting results when it hits the preheated surface. Spraying is accomplished by moving the gun either horizontally across the target or vertically, whichever direction is conducive to good coverage of the target.

The thickness of the sprayed polyethylene coating depends on the powder supply, the flame, and the hand movement of the gun. It is advisable to make the spraying passes approximately 2 in. wide and, immediately upon completion of one path, to overlap it until the desired thickness is reached. Using this technique, a coating thickness of $\frac{1}{32}$ in. can be achieved with two passes. By carrying out the same procedure the coating thickness can be built up to $\frac{1}{8}$-in. thickness and more. The heat supplied by the flame must be such that the powder melts upon striking the target and fuses to produce a smooth film. On small areas, sufficient time must be allowed for cooling to prevent local overheating.

The spraying can be interrupted by opening the bypass valve, thus raising the temperature of the flame and reducing the suction. By judicious use of this short, high-temperature flame, polishing or glazing of surface may be achieved.

Testing

The thickness of the coating can be determined by a magnetic thickness tester which operates on alternating current. Thickness may also be determined by means of a magnified micrometer which amplifies the magnetic attraction between a permanent magnet and a tension spring. Such a calibrated tool gives reliable readings of the thickness.

Porosity of the polyethylene coating may be tested by using a high-frequency tester delivering 30,000 to 60,000 volts; sparks appear wherever porosity occurs (Fig. 3).

Adhesion Test

To test adhesion of the coating, a sprayed plate can be cut in $\frac{1}{2}$ in. from the edge. A sharp knife is then inserted between the coating and the metal plate, and the coating pried away from the metal. The polyethylene film can be pulled loose from uniformly cleaned and preheated plates only in small pieces. A continuous film cannot be removed from such surfaces.

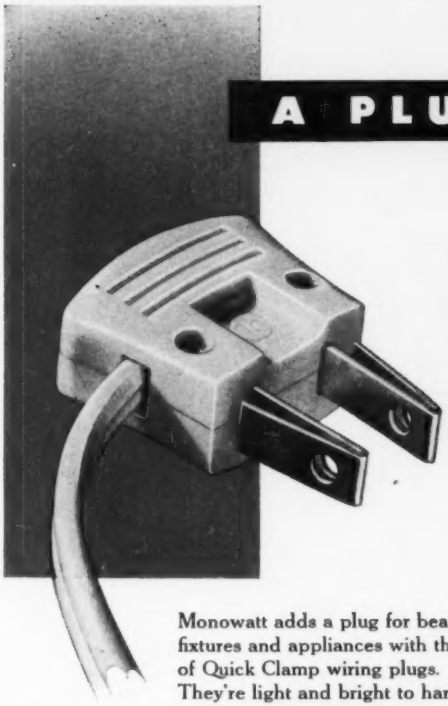
To test the quality of a film of sprayed polyethylene, a metal sheet with an unroughened surface is used. A coating sprayed on a smooth surface can be peeled off in strips $\frac{1}{4}$ in. wide and 3 to 4 in. in length. To test elongation, points should be placed about $\frac{1}{2}$ in. apart on the strip, and the strip should be stretched. A film of approximately $\frac{1}{16}$-in. thickness should elongate over 100% in such a test.

Test Cup Observation

The previously mentioned tests show whether the coating is uniform and whether it contains degraded material. For many uses of sprayed polyethylene coatings, further tests

Table I.—Physical Characteristics of Polythene

Sp. gravity		.92-.94
Refractive index	n_D^{25}	1.52
Tensile strength	lb./in.^{2}	2300-3100
Elongation	%	200-600
Flexural strength	lb./in.^{2}	1500-1700
Impact strength	ft. lb./in. notch	3
Sp. heat	cal./°C. gm.	.55
Thermal expansion	10^{-5}/°C.	64
Thermal conductivity	cal./sec./cm./°C./cm.	7×10^{-4}
Resistance to heat (continuous)	°C.	80
Flammability	in./min.	1.1-1.4
Softening point	°C.	100-115
Hardness	Rockwell	R.25-R.35
Effect of light		unaffected
Water absorption	24-hr. immersion	nil.
Moisture vapor permeability	mgm.sq.in./day	1
Dielectric strength	v/mil short time on films 3-15 mils thick	1000-1500
Dielectric constant	from 1-100Mc/s	2.3
Power factor	from 1-100Mc/s	0.0005
Vol. resistivity	ohms/cm^3	3×10^{17}



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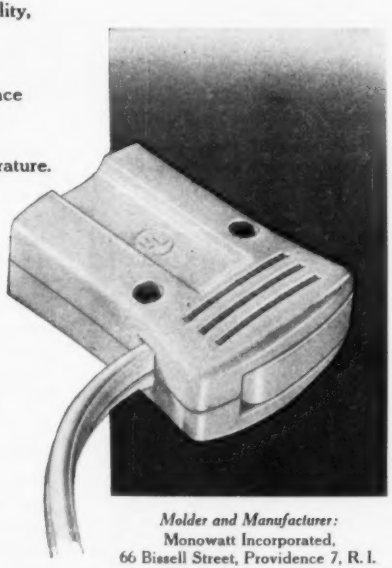

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Table II.—Resistance of Polyethylene to Chemical Attack

	At room temperature	At 60° C. 140° F.		At room temperature	At 60° C. 140° F.
Acetic acid 10%	•	•	Hydrogen peroxide 90%	•	–
Acetic acid 100%	0	–	Iodine	–	–
Acetone	0	–	Lactic acid 10%	•	•
Ammonia 880 sp. gr.	•	•	Lactic acid 90%	•	•
Ammonium carbonate	•	•	Methyl bromide	•	
Aniline	•	–	Milk	•	
Beer	•		Mineral oil	0	–
Benzene	–	–	Nitric acid 10%	•	•
Bromine (vapors or liquid)	–	–	Nitric acid 30 to 50%	•	•
Calcium hydroxide	•	•	Nitric acid 70%	•	•
Carbonic acid	•	•	Nitric acid 95%	0	–
Carbon tetrachloride	–	–	Petrol	–	–
Caustic potash up to 50%	•	•	Phosphoric acid 30%	•	•
Caustic potash 50% and over	•	•	Phosphoric acid 90%	•	–
Caustic soda up to 50%	•	•	Photographic developer	•	•
Caustic soda 50% and over	•	•	Potassium chloride (saturated)	•	•
Chlorine 100%	–	–	Potassium dichromate 40%	•	•
Chromic acid	•	•	Silver nitrate 10%	•	•
Cider	•		Sodium carbonate, diluted	•	•
Citric acid (cold saturated)	•	•	Sodium carbonate (saturated)	•	•
Copper sulfate	•	•	Sodium chloride (saturated)	•	•
Cyclohexanone	–	–	Sodium sulfate	•	•
Dibutyl phthalate	•		Sulfuric acid 10%	•	•
Di-ethylene glycol	•	0	Sulfuric acid 70%	•	0
Distilled water	•	•	Sulfuric acid 98%	0	–
Ethylene dichloride	–	–	Sulfurous acid	•	•
Gin	–		Tallow	•	•
Glycerol 50%	•	•	Tannic acid	•	•
Formaldehyde	•		Tanning extracts	•	•
Formic acid 100%	•	•	Trichlorethylene	–	–
Formic acid up to 50%	•	•	Vegetable and animal oils	–	–
Hydrobromic acid 50%	•	•	Vinegar	•	•
Hydrochloric acid 10%	•	•	Whiskey	–	
Hydrochloric acid more than 35%	•	•	Wine	–	
Hydrofluoric acid 40%	•	•	Xylene	–	–
Hydrofluoric acid 75%	•	•	Yeast	•	
Hydrofluosilicic acid	•	•	Zinc chloride	•	•
Hydrogen peroxide 30%	•	0	Zinc sulfate	•	•

Legend: • satisfactory; 0 slightly attacked; – unsatisfactory; blank spaces indicate that data are not yet available.

3—High-frequency tester checks porosity of sprayed coating in a tank

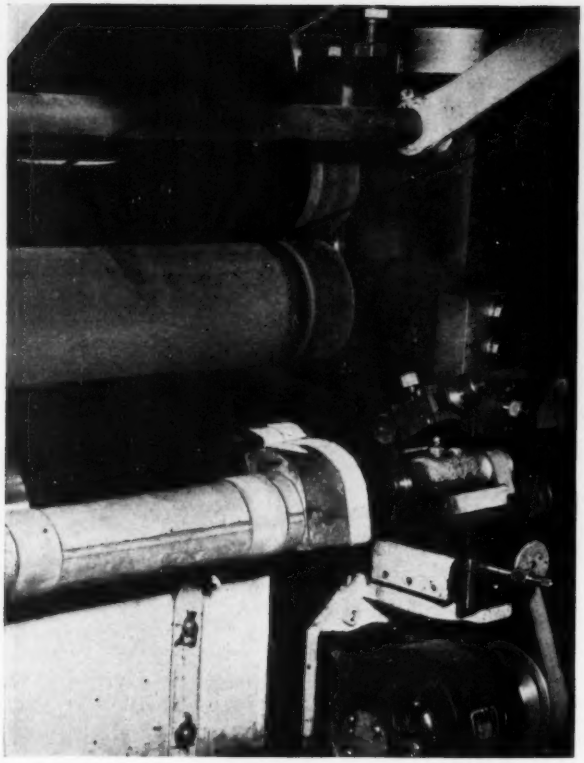
ILLUSTRATIONS COURTESY AMERICAN AGILE CORP.

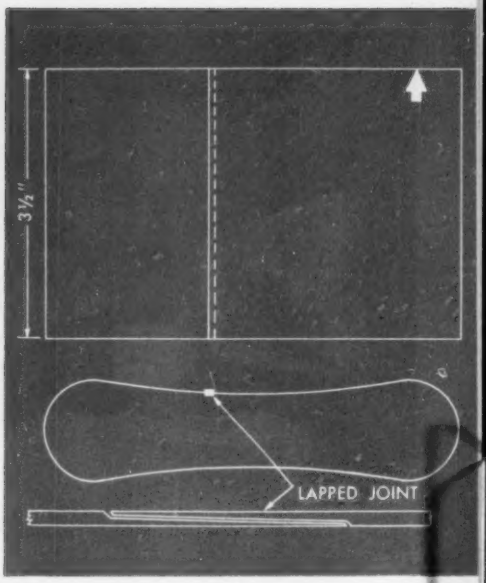
are not necessary. However, where the coating is to be subjected to corrosive agents, to extreme changes in temperature, or to other circumstances which indicate further testing, use of the test cup will give reliable results. These test cups may be from 4 to 8 in. in diameter. They are sprayed with polyethylene to a 1/16-in. coating thickness, are then filled with the corrosive material, and the coating visually inspected through several weeks or months.

Conclusion

With flame spraying of polyethylene, industry has gained a useful method of preventing corrosion. It is probable that, in the future, many types of storage tanks, drums, and materials will utilize this coating method. The spray technique described bids fair to become common practice in the chemical industries partly as a substitute for zinc and lead tank lining and partly for application in particular jobs where the polyethylene coating will surpass anything else available.

Some of the present applications and fields for flame-sprayed polyethylene coatings include the food and brewery industry where the coatings are being used in fermenting vats. The textile industry is using tanks lined with polyethylene for holding acids. The bleaching and dyeing industry is experimenting with polyethylene-coated test cups with the aim of utilizing flame-sprayed polyethylene wherever corrosion resistance is necessary.





1—Lower drawing of lapped joint in ethyl cellulose belt is exaggerated to illustrate detail

2—Scarfing unit. At right is one milling cutter. Reels at top wind ribbons cut from edge

Fabricating Endless Belts

by HERBERT CHASE

Making scarfed joints in thin film requires special machines capable of close-tolerance work. Cement is applied under constant pressure

FOR some two generations, Dictaphone recordings, widely employed in business establishments, have been made on wax cylinders. Such cylinders, still in extensive use, are re-used several times by shaving the surface between successive recordings. But the newer Dictaphone models, instead of using wax cylinders, use a record made in the form of an endless belt of ethyl cellulose film. This new recording medium has the advantage that it is flexible, non-fragile, and very light and compact. Recordings made by traveling executives, who often carry portable Dictaphones, can be mailed to the home office for transcription. The belts are not designed for repeated use but are filed or discarded after being transcribed; hence no method of shaving the surface after initial use has been provided.

The ethyl cellulose film averages between 0.0055 and 0.0065 in. in thickness. Each belt is 3½ in. wide and measures 12 in. in circumference. The film employed for belt manufacture is purchased from The Dow Chemical Co. in rolls 13 in. wide, but the belts are made on a special machine developed and used by Dictaphone Corp.

Scarfed Joints

The film handled by this machine is converted into a tube having a scarfed and lapped longitudinal joint or seam. (See Fig. 1) As the tube is produced, 3½-in. lengths are cut off automatically, and it is these lengths that form the belts ready for use in recording.

In developing this fabricating method, automatic means for making a scarfed joint were perfected, and the joint, besides meeting

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NOTE: In April our copy for this column stated that "consumption of urea and melamine . . . thermosetting molding compounds increased from 58,000,000 lbs. in 1946 to 112,000,000 lbs. in 1949." The word "molding" should not have appeared. The figures include other uses of the resins.

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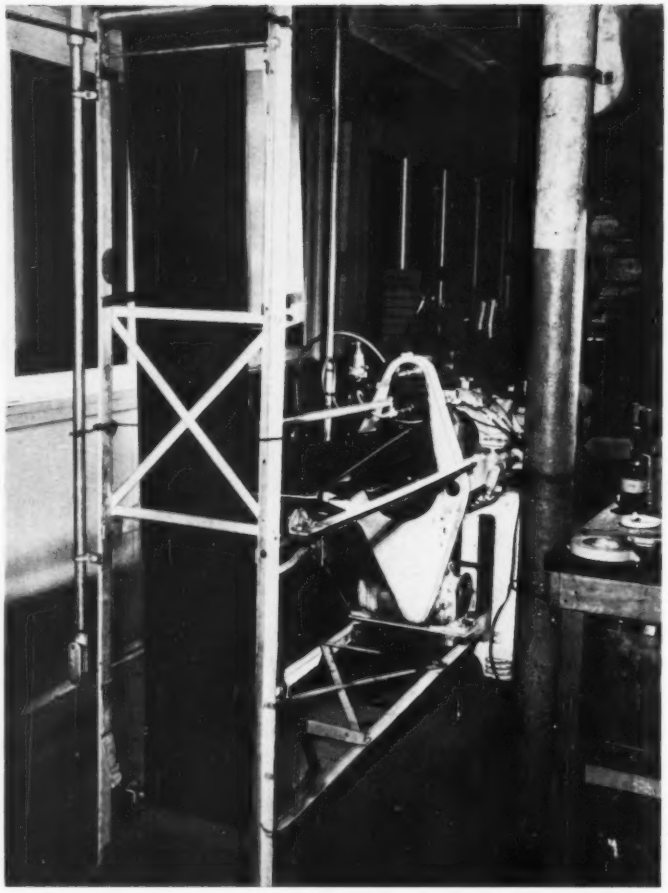


3—Film with scarfed edges feeds down through floating takeup roll on the end of a hinged frame near the floor—and then over another roll into tube-making machine in the background

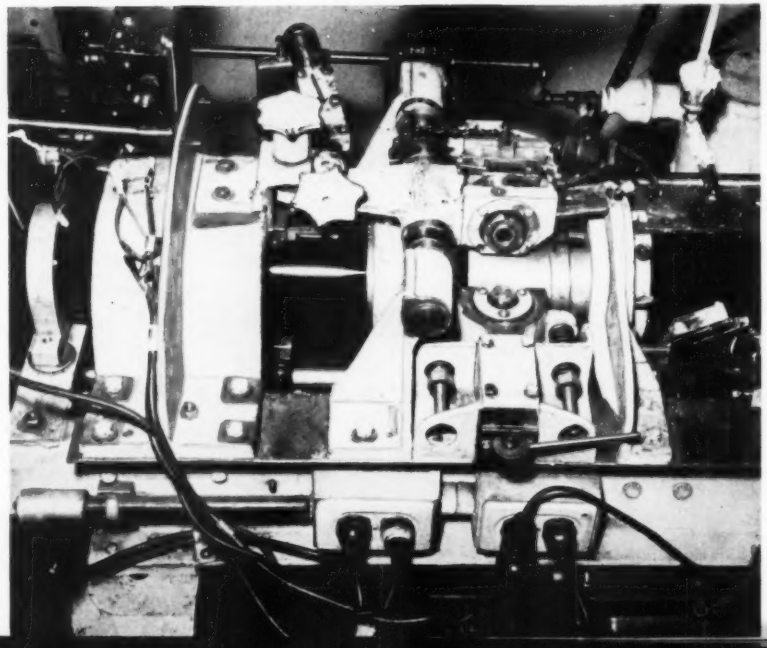
strength requirements, is held to a thickness that does not exceed that of the film by more than 0.0012 inch. The belt circumference at one edge does not differ from that at the other by more than 0.010 inch. These are close limits in working with plastic film on a production scale but are held in the set-up devised for the purpose.

All belts are marked with an arrow pointing to one edge. This arrow indicates the edge that goes in first when the belt is applied to recording and transcribing machines. Placing the belt in this manner makes the sapphires that produce and transcribe the recording ride down over the lip of the joint; hence the sapphire never can catch under the lip and give trouble.

Milling Cutters Used

The lap joint makes it necessary to scarf the edges to be lapped. This scarfing is done in one unit of the machine developed especially for belt manufacture. A part of this unit is shown in Fig. 2. Scarfing is done by two formed milling cutters of high-speed steel about 1 in. in diameter that are belt driven at about 5700 r.p.m. or a surface speed of 1860 ft. per minute. Depth of cut is adjusted by a micrometer, the cutter being locked at the correct depth when correctly set.

There is one cutter for each edge



4—In tube-forming unit, film is pulled through the ring at left and becomes a tube that is moved by inner and outer rolls, center. Cement is applied to scarfed joint by a hypodermic tube not shown here

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This new bulletin contains useful information such as specifications, physical and chemical properties, and solubility and compatibility data for Barrett* "ELASTEX" Plasticizers and Dibutyl Phthalate:

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A copy will be sent you on request.

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of the plastic film, which is received in rolls 13 in. wide. Cuts are made as the film passes over steel rolls in being unwound at the desired rate by drive rolls whose speed is adjusted by a variable speed transmission driven by a contant-speed motor. Cutters are precisely spaced so as to make the scarfing cuts at a fixed distance apart. This setting largely controls the circumferential length of the belts produced.

Since the scarfing cuts go only half way through the film and are not made at the extreme edge of the film, it is necessary to cut off the film at the outside edge of each scarf. These cuts are made by fixed circular knives that are precisely set to sever a narrow ribbon from each edge of the film. The ribbons produced are rolled off on reels and constitute scrap.

After being scarfed, the film feeds over overhead rolls and down through a floating takeup device, Fig. 3, that is a part of the second unit of the machine. The takeup compensates for any slight difference in speed as between the driving rolls of the first unit and those that draw the film forward and feed it through the tube-forming and joint-cementing unit. After passing the takeup, the film is pulled through a ring, left in Fig. 4, that shapes it into tubular form and brings the two scarfed edges together so that they lap precisely.

Cementing

As the lap is made, a liquid cement consisting of ethyl cellulose and a solvent is applied from a hypodermic needle. This liquid is fed by a small pump that applies a constant pressure and is adjusted to provide a uniform flow. This is important because insufficient cement makes a joint lacking desired strength; too much results in smearing that is responsible for rejection of belts produced.

Immediately after the liquid is applied, the tube passes between a set of expanding internal rolls and a mating set of external rolls pressed inwardly. These rolls, Fig. 4, grip the walls of the tube formed and advance it over a fixed mandrel. External rolls at the top, where the joint is made, are heated to a precisely controlled temperature of 140° F. to dry the cement in a fixed interval and effect a strong and uniform joint of substantial constant thickness.

The tube produced is advanced continuously over the mandrel until, near its end, a knife moving circumferentially cuts off 3½-in. lengths. At the same time, a small inked marker prints an arrow at one edge of the belt. As the tube is advancing continuously, both the knife and the marker have to be advanced longitudinally at the same rate as the tube. This is done by pneumatic means in a precisely timed relation; the instant that the knife and marker have completed their functions they are automatically withdrawn and retracted longitudinally to start a new cycle. In other words, a flying cutoff and printing marker are required.

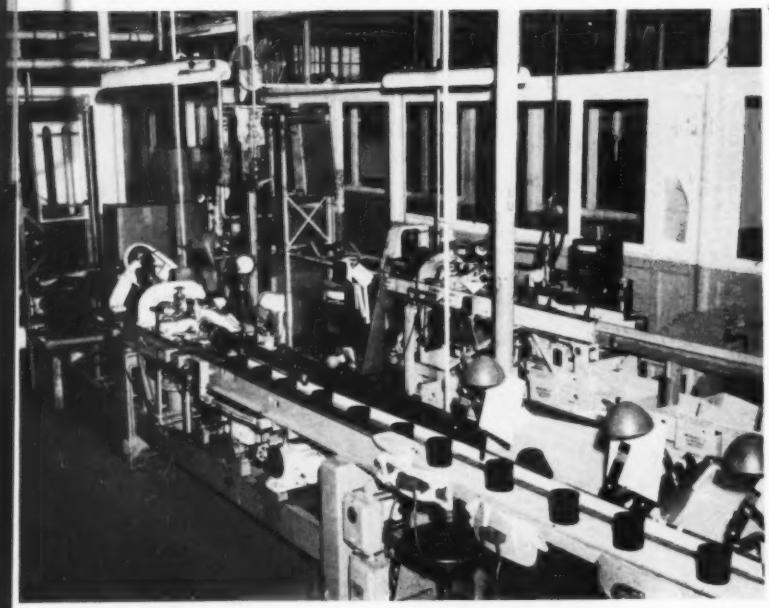
Inspection

Lengths of tube, which have now become belts 3½ in. wide, are pushed off the mandrel as rapidly as they are made and fall onto a conveyor belt that moves them through four inspection stations. Immediately after cutoff, however, the belts, edge up, pass under a small hot-air dryer that sets any cement not already dried completely, including any at the inside face of the belts. This helps to avoid any subsequent smearing of the liquid.

As the belts are advanced by the belt conveyor, Fig. 5, the inspector at each station checks each belt produced for correct width, smearing of cement, adherence of edges at the seam, and freedom from pinholes. Rejects are placed in boxes marked according to the class of defect found. If defects result from faulty action of the machine, this is quickly reported and remedied by a supervisor. Acceptable belts are assembled into groups of 10 each and the groups go into packing cartons at the end of the line.

At fixed intervals, belts are taken from the end of the inspection line and are checked for taper (difference in circumference from edge to edge) and for strength of joint in special fixtures. The joint must withstand a minimum of 150 lb. pull to pass inspection. Any failures are occasion for further tests from the group just produced to make sure that each lot meets strength and taper requirements.

5—Tube making machine is in left background. A conveyor carries finished ethyl cellulose record belts past inspection stations in right foreground



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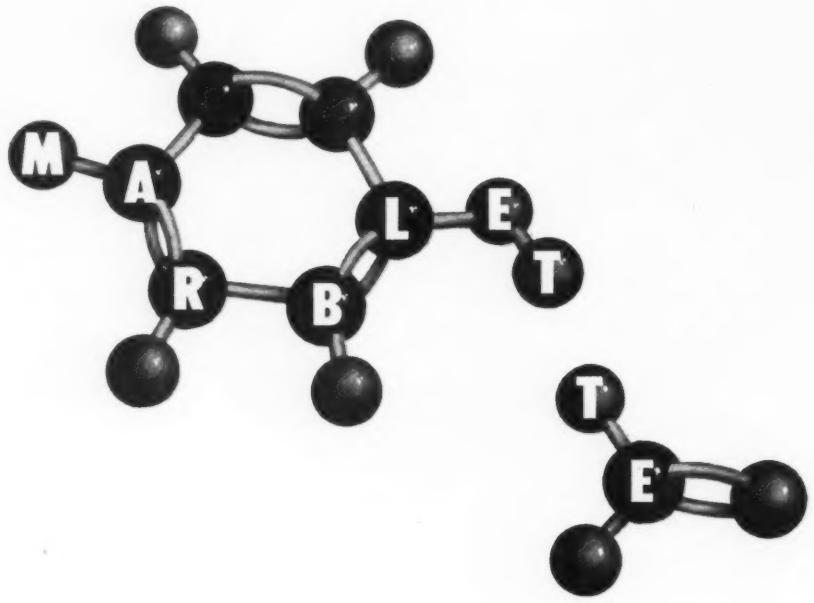

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Permeability of Polymeric Films to Organic Vapors

by V. L. SIMRIL† AND A. HERSHBERGER†

The permeabilities of 16 polymeric films to organic vapors are reported in terms of the permeability constant P*. The effects on permeation rates of film and vapor structure and properties are discussed and related to the general theory of permeation advanced previously by other workers. It is shown that the least permeable polymers are those whose molecular structure is such as to permit close packing and strong intermolecular bonding and whose adsorption, or solution, of vapor is low. The presence of bulky side chains and the introduction of plasticizers increase permeability in general. Chemical and electrical similarity of polymer and vapor increases solubility, and therefore, permeability. The effects of temperature and film thickness are also discussed in the light of polymer and vapor characteristics. The data presented here strongly suggest the possibility of tailor-making films to yield any degree of permeability to any organic vapor.

THE rapid increase in the use of thin polymeric films as protective materials in recent years has resulted in the publication of a number of investigations into their vapor and gas permeability characteristics. Major attention in the past has been devoted to water vapor permeability and to a few of the permanent gases, but it is becoming increasingly evident that polymeric films also have varied, interesting, and useful organic vapor-transmission properties. Accordingly, the investigation reported here was undertaken to obtain quantitative data on the rates of transmission of several vapors representative of different classes of organic compounds through a number of polymeric films. Further objectives of this study were to relate permeability rates to the chemical and physical properties of polymers and vapors and to find the temperature dependence of permeability.

Sixteen polymeric films were investigated during this study. They are listed together with their compositions and methods of preparation in Table I. All of the non-cellulosic experimental films were prepared by dissolving the polymers in suitable solvents, doctoring these solvents onto glass or metal surfaces, and heating to remove the solvent. Especial care was taken to ensure complete removal. The cellulose acetate film was prepared in continuous form by doctoring an acetone solution onto a revolving, heated, metal-surfaced drum. The regenerated cellulose films were prepared by the familiar viscose process, and the moistureproof coating was applied by doctoring a coating solution of vinylidene chloride/acrylonitrile copolymer onto uncoated, plasticized regenerated cellulose film and heating to remove solvent.

Diligence was exercised in employing only pure chemicals for this study. C. P. reagents were used wherever possible. Refractive indexes of the compounds were checked against those listed in the literature, and, where appreciable differences existed between the two values, the compounds were fractionally distilled until a fraction was found whose refractive indexes and boiling points corresponded closely to the literature (see Table II).

Permeability Measurements

All permeability determinations were made by placing the reagent in aluminum Thwing-Albert Vapometer cups (shown in Fig. 1), closing the top of the cup with film, placing the cup in a constant temperature box, and weighing the cup at intervals until a constant rate of weight loss was obtained. The method used was similar to that of Charch and Scroggie (1)†† except that Vapometer cups were used because they provided for sealing the films across the cups by means of rubber gaskets and clamping rings rather than by using a wax sealant. Vapor loss through the sealing gasket was negligible.

The quantity of compound placed in the cup was determined by experience. It was realized that the distance of the film from the top of the liquid would affect the rate of loss of rapidly diffusing vapors (1). The probability of such varying permeability was minimized, wherever possible, by placing a roughly standard volume of compound (20-

*Reg. U. S. Pat. Office.

†Research Sect., Technical Div., Film Dep't., E. I. du Pont de Nemours & Co., Inc., Buffalo, N. Y.

††Numbers in parentheses links to "References" at end of article.

Table I.—Film Composition and Preparation

Film No.	*Composition*	*Preparation*
I	Polythene (ethylene polymer)	Cast from xylene solution
II	Vinyl chloride/diethylfumarate copolymer (95/5 weight ratio)	Cast from toluene/methyl ethyl ketone solution
III	Vinyl butyral/vinyl alcohol copolymer (89/11 mole ratio)	Cast from toluene/isopropanol solution
IV	Vinyl alcohol polymer; no plasticizer	Cast from water solution
V	Vinyl alcohol polymer; 15% glycerol plasticizer	Cast from water solution
VI	Acrylonitrile polymer	Cast from dimethylformamide solution
VII	Nylon; 66/610/6 polyamide (40/30/30 weight ratio)	Cast from isopropanol/water mixture
VIII	Vinylidene chloride/acrylonitrile copolymer (90/10 weight ratio)	Cast from toluene/methyl ethyl ketone solution
IX	Styrene polymer	Melt extruded and stretched in both machine and transverse directions
X	Cellulose acetate (56% combined acetic); no plasticizer	Cast from acetone solution
XI	Cellulose acetate (56% combined acetic); 9% dimethoxyethyl phthalate plasticizer	Cast from acetone solution
XII	Regenerated cellulose; no plasticizer	Viscose process
XIII	Regenerated cellulose; 22% glycerol plasticizer	Viscose process
XIV	Regenerated cellulose; 17% ethylene glycol plasticizer	Viscose process
XV	Film XIII with a moistureproof coating (6-7 gm./sq. meter) of vinylidene chloride/acrylonitrile copolymer (80/20 weight ratio)	Viscose process and solution coated
XVI	Same as Film XV but with a coating of 90/10 weight ratio vinylidene chloride/acrylonitrile copolymer	Viscose process and solution coated

30 ml.) in the cups. However, in the case of certain rapidly diffusing liquids, it was necessary to place as much as 100 ml. of liquid in the cups in order to make weighings over a sufficient period of time to allow the rate of loss to become constant. Total cup capacity was about 150 ml.

Four-in. disks of film were selected for uniformity and absence of visible holes and bubbles and were placed loosely over the cups. Then the cups were placed in the constant-temperature oven (see below). After the cups and their contents had reached the test temperature, the films were sealed in place by means of the rubber gaskets and clamp rings. This procedure was followed to insure that the total pressure of the air and vapor within the cups would be one atmosphere at the test temperature. Changes in pressure inside the cup after the film was sealed in place distorted the film in such a manner as to increase the film's area and decrease its thickness. Both changes lead to falsely high permeation rates.

In some cases in which the vapor was at least a partial solvent for the film, the film tended to become blown out in a dome-shape despite precautions taken to ensure equal inside and outside total pressures. It was concluded that the higher partial pressure of the air on the outside of the cups forced air through the films into the cups until the total pressure of air and vapor became greater than atmospheric. This phenomenon did not occur for the majority of the film-vapor combinations tested either because of the impermeability of the film to air or because the film was not softened by the vapor and, therefore, was able to withstand the excess pressure. However, in those cases in which film distortion did occur, it was necessary to drill holes 0.003 in. in diameter in the cup walls to release internal pressure. The cups were calibrated for loss of vapor through these holes by determining the rate of loss when a sheet of aluminum foil free from pin holes was substituted for the polymeric film across the cup top.

Determinations were made at 35° C. for all film-vapor combinations. Determinations were also made for several combinations at two other temperatures in the 10 to 35° C. range in order to determine the temperature dependence of permeability. The cups were stored during the determinations in controlled temperature ovens in which air was constantly circulated over concentrated sulfuric acid to maintain a relative vapor pressure of the permeant (only one permeant was ever tested in an oven at a time) of 2% or less. Analyses showed that the permeants' relative vapor pressures outside the cups were generally very close to zero, and all calculations were made on the basis of 100% relative vapor-pressure differential across the films. The temperature of the storage ovens did not vary more than ±0.5° C. from the desired average during individual determinations and the average temperature for any test did not vary more than ±0.1° C. from values in Tables III, VIII, and IX.

Cups were taken out of the storage ovens in groups of three, weighed quickly to the nearest milligram, and immediately replaced in the ovens to avoid abnormal losses caused by temperature changes. Three cups were used for each film-vapor combination at each temperature. Tests were continued until comparable weight losses were obtained for three successive daily weighings. Weight losses from individual cups were not allowed to

1—Vapometer equipment: A—cup; B—clamp ring, gasket, screws; C—cup assembled, film in place

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vary more than 5% from the average of the three cups. Those varying more than this amount were discarded. All values used in this report are the averages of values for at least two cups.

The permeability data given in all tables are expressed in terms of a permeability constant P* which is defined as the number of moles of vapor passing through 1 sq. cm. of film, having a thickness of 1 cm., per sec. per cm. (Hg) vapor-pressure difference across the film. The permeability constant P* is useful in that it expresses permeability in terms of a unit thickness of film, a unit vapor-pressure differential across the film, and in moles instead of grams. Thus, one may compare at a glance the actual variations in permeability attributable to the natures of the films and vapors and to the temperature of testing.

Table II.—Physical Constants of Reagents

Compound	Refractive index					Boiling point at 760 mm.			
	Literature*			Observed		Literature*			Observed
	Temp.	n_D	Ref.	Temp.	n_D	Temp.		Ref.	temp.
	°C.			°C		°C.			°C.
Acetone	19.4	1.35886	R	19.5	1.3600	56.24		W	56
						56.5		R	
Acetic acid	20	1.37182	R	20	1.3730	118.1		R	118
						118.11 ± 0.2		W	
n-Butylamine	20	1.401	R	20	1.4015	77.8	(76-78)	R	75.5—76
n-Butyl ether	..	.....	..	...	.....	142		R	142
Butyraldehyde	20	1.38433	R	20	1.3824	75.7		R	74
Butyric acid	20	1.39906	R	20	1.3990	163.5 at 757 mm		R	162—163
Carbon tetrachloride	20	1.46040	W	20	1.4617	76.71		W	.....
Cyclohexane	15	1.42900	R	15	1.4292	80.80		W	81
	20	1.42636	W	25	1.4240	81.4		R	
Ethanol	18.35	1.36242	R	18.5	1.3635	78.5	(78.37)	R	78
	20	1.36232	W	20	1.3620	78.32		W	
Ethyl acetate	18.9	1.37216	R	18.9	1.3731	77.15		R	77.3—77.5
	20	1.37257	W	20	1.3727	77.15		W	
Hexane	20	1.37536	R	20	1.37526	69.0		R	69
		1.37506	W			68.71		W	
Methanol	14.5	1.33118	R	14.5	1.3315	64.65		R	64.5
						64.72		W	
Benzene	15	1.50142	R	20	1.5020	80.093—.094		R	79.5—80.0
	20	1.50439	W			80.122		W	
n-Propanol	..	.....	..	...	.....	97.18		R	96.8—97.2
n-Butanol	..	.....	..	...	.....	117.71		R	117.0—118.0

* Code for literature references:
R = Handbook of Chemistry and Physics, 26th Ed., pp. 542-1108.
W = Organic Solvents, by A. Weissberger and E. Proskauer.

Experimental Results

All of the permeability data obtained in this study are reported as permeability constants P* in Tables III, VIII, and IX. The work has thus been divided into three major parts. The data in Table III show the general effect of the inter-relationships of film and vapor characteristics on permeability. The data in Table VIII show the effect of vapor structure on its diffusion through one specific film (polythene). The data in Table IX show the effect of temperature on the permeability of a specific film (polythene) to vapors of varying characteristics.

The mechanism of transport of small molecules through polymers has been the concern of numerous investigators in recent years. The theory developed has been summarized in several publications (2-7) in the last 10 years and therefore need not be discussed in detail here. In simplest terms, the mechanism of transport may be stated in terms of the following three major processes:

1. Small molecules flow through preformed holes or capillaries. This flow may consist of molecular streaming or of viscous flow depending upon the relative sizes of the holes and permeating molecules. The rate of permeation is influenced by the vapor-pressure differential across the film and the sizes and shapes of the diffusing molecules and holes. This process is said to be "unactivated" and is temperature dependent only in the sense that the vapor-pressure differential increases with the temperature.

II. Small molecules diffuse through the mass of the polymer itself by way of holes which are opened temporarily by the thermal motion of the polymer chains. This process is said to be "activated" and is definitely temperature dependent. The diffusing molecule is thought to be dissolved in a hole in the polymer until another hole opens nearby into which it may move. By repeated moves of this type, the molecule progresses through the polymer in the direction of the pressure gradient and eventually escapes at the low pressure surface. The polymer's interchain bonding forces and its general chain mobility are important because they determine the ease of hole formation.

III. The third process is also one of activated diffusion and involves the interaction of the diffusing molecule with active spots on the internal surfaces of the polymer. The diffusing molecule is thought to be adsorbed on one of these active spots and to vibrate in this position until it acquires sufficent energy to evaporate from this position. Once free, it will move through the polymer until re-adsorbed on another active spot. This process is also temperature dependent and the molecule will move, statistically, in the direction of decreasing pressure.

If the active spot on which the diffusing molecule adsorbs had been previously involved in interaction with another portion of its chain, or with an adjacent chain, thus forming an intra- or intermolecular bond, adsorption of a foreign particle might weaken the bond, or even disrupt it entirely. Such weakening

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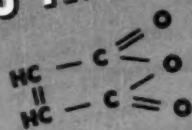

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Table III.—Permeability of Polymeric Films to Organic Vapors

		$P^* \times 10^{11}$ moles/sq.cm. area/cm. thickness/sec./cm. (Hg) vapor-pressure differential at 35° C.						
	Film No. and Type	*Benzene*	*Hexane*	*Methyl ethyl ketone*	*Carbon tetra-chloride*	*Ethanol*	*Ethyl acetate*	*Water*
I	Polythene (ethylene polymer)	236.5	130.1		170.0	2.494	22.9	4.525
II	Vinyl chloride/diethylfumarate copolymer	46.19	Sol.		5.565	0.1815	93.06	22.88
III	Vinyl butyral/vinyl alcohol copolymer	196.4	Sol.		98.27	148.5	187.2	98.15
IV	Vinyl alcohol polymer; no plasticizer	0.1596	0.1045		0.0718	1.458	0.113	575.10
V	Vinyl alcohol polymer; 15% glycerol plasticizer	0.1426				3.4-1.2		
VI	Acrylonitrile polymer	0.1166	0.0708		0.0657	0	0.0597	18.74
VII	Nylon (66/610/6 polyamide)	0.1734	0.1975		0.0504	137.3	0.1293	156.10
VIII	Vinylidene chloride/acrylonitrile copolymer	21.56	0.0545		0.0100	0.0145	60.55	0.8458
IX	Styrene polymer	475.4			304.3	0	Sol.	48.31
X	Cellulose acetate; no plasticizer	22.86	0.1248		0.1669	133.0	160.5	1016.00
XI	Cellulose acetate; 9% di-methoxyethyl phthalate plasticizer	44.9				77.83		
XII	Regenerated cellulose; no plasticizer	0.0627	0.0407		0.0373	3.829	0.60	615.70
XIII	Regenerated cellulose; 22% glycerol plasticizer	0.0493				105.1		
XIV	Regenerated cellulose; 17% ethylene glycol plasticizer	0.0468				36.01		
XV	Film XIII with a moistureproof coating of 80/20 vinylidene chloride/acrylonitrile copolymer	0.0514	0.4460	0.1367	0.0309	<0.1		5.836
XVI	Same as Film XV but with 90/10 vinylidene chloride/acrylonitrile copolymer coating	0.0295		0.4335		0	0.1265	

of intermolecular forces increases the probability of hole formation through thermal motion and may increase the surface of active spots available for adsorption of diffusing molecules. Thus, chances for diffusion, both through thermally produced holes (Type II) and by adsorption-desorption processes (Type III), are materially affected by the degree of adsorption of the diffusing molecule. The energies and entropies of activation in this process are a consequence of the specific attraction of active spots on the polymer for the diffusing molecules, whereas, in the second process, they are involved mostly with the erratic segment motion of polymer chains.

In line with this theory it might be predicted that polymers having strong interchain bonding forces (cellulose, nylon, etc.) or those whose symmetry is such as to permit extensive crystallization even though interchain forces are weak (polythene) will exhibit low permeability. It might also be expected that anything which tends to decrease the interchain bonding or the closeness of packing of polymers will increase their permeability. These and other film factors influencing permeability are discussed in greater detail and illustrated in the following paragraphs and tables.

Effect of Holes on Permeability

The contribution of permanent, or preformed, holes to the permeability of the films studied is probably small. The relatively low permeability of all films to gases, as contrasted with vapors (8), is evidence for this statement. Discounting molecular size differences, the diffusion of gases and vapors through preformed holes should be roughly equivalent. Further, it is reasonable to conclude that thermal hole formation in any given polymer should permit two small molecules of equal size but different composition to pass through at equal rates. Inasmuch as the diffusion rates for small molecules through

(*Continued on p. 150*)

Table IV.—Effect of Side Chains on Vapor Permeability

	Film No. and type	$P^* \times 10^{11}$ at 35° C.		
		Benzene	CCl_4	*Water*
XIII	Regenerated cellulose	0.063	0.037	616.00
X	Cellulose acetate	22.900	0.167	1016.00
IV	Polyvinyl alcohol	0.160	0.072	575.00
III	Vinyl butyral/vinyl alcohol copolymer	196.000	98.300	98.15
I	Polythene	236.000	170.00	4.52
IX	Polystyrene	475.000	304.00	48.31

Table V.—Effect of Plasticizers on Vapor Permeability

Film No. and type		$P^* \times 10^{11}$ at 35° C.	
		Benzene	*Ethanol*
IV	Polyvinyl alcohol	0.160	1.46
V	Polyvinyl alcohol; 15% glycerol	0.143	3.41
XIII	Regenerated cellulose	0.063	3.83
XIV	Regenerated cellulose; 22% glycerol	0.049	105.10
X	Cellulose acetate	22.86	133.00
XII	Cellulose acetate; 5% dimethoxyethyl phthalate	44.90	77.83

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General

PLASTICS CATCH UP. P. O. Powers. Chem. Eng. News *28*, 33-4 (Jan. 2, 1950). Developments in plastics in 1949 are reviewed briefly.

WHAT'S NEW? J. H. DuBois. S.P.E. J. *6*, 3-9 (March 1950). New developments in materials, processes, and equipment in the field of plastics are described.

AUTOMOTIVE. J. K. Totten. S.P.E. J. *6*, 13-15 (Mar. 1950). Performance specifications for plastic steering wheels and automotive ignition parts are presented.

OUTPUT OF PLASTICS IN BRITAIN. Brit. Plastics *22*, 115-17 (Mar. 1950). Production figures for plastics in Britain from 1941 to 1948 are reported. The total production has increased from 24,300 tons in 1941 to 89,400 tons in 1948.

CLEANING PLASTICS COMPONENTS. Brit. Plastics *21*, 598-603 (Nov. 1949). Solvents and processes for cleaning articles molded of various types of plastics are described.

Properties

HEAT RESISTANCE OF LAMINATED PLASTICS. L. E. Sieffert and E. M. Schoenborn. Ind. Eng. Chem. *42*, 496-502 (Mar. 1950). A simple, effective laboratory research procedure was developed for evaluating the heat resistance of laminated plastics in terms of the critical thermal instability temperature. The rate and extent of thermal decomposition is measured by experimentally determining the loss in weight with time of a number of small specimens maintained at a series of fixed temperatures for periods up to 72 hr. duration. By a simple graphical treatment of the data, the temperature at which the material becomes thermally unstable is readily found. This temperature is called the critical thermal instability temperature. Results obtained for 11 different laminates are presented and their relative critical thermal instability temperatures compared. Critical temperatures ranged from 140° C. for a glass-base low-pressure polyester to 350° C. for several glass-base silicones. With the exception of the glass-base melamines, all materials tested showed loss in resin content of less than 7% at their critical temperatures.

LOW TEMPERATURE STIFFENING OF ELASTOMERS. S. D. Gehman, P. J. Jones, C. S. Wilkinson, Jr., and D. E. Woodford. Ind. Eng. Chem. *42*, 475-82 (Mar. 1950). The generally observed stiffening of elastomers at low temperatures may be supplemented by the occurrence of crystallization if the elastomers have sufficient regularity of molecular structure and other conditions are favorable. To study these effects, observations of the progressive stiffenings of elastomer compounds at low temperatures were made by measurements of the relative torsional modulus of test strips mounted in racks which were stored at low temperature. The periods of observation extended over 30 to 60 days with temperatures in the range from —59° to —18° C. A correlation was found between density changes due to crystallization as determined dilatometrically and torsion stiffness changes. Factors studied in addition to temperature included compounding variables such as cure and plasticizer content. Some data were obtained to show the acceleration of crystallization due to compressive stress. Progressive stiffening due to crystallization was observed for vulcanizates of Hevea, neoprene-type GN, and Butyl rubber as well as for an 85-15 butadiene-styrene redox-type copolymer. The results were interpreted in accordance with concepts of crystal nucleation and growth with necessary modifications due to the molecular structure of elastomers. Although the phenomenon of spontaneous crystallization of elastomers was found to be complicated by many factors, a useful degree of generality appears in some of the results.

RAPID SWELLING AND DE-SWELLING OF REVERSIBLE GELS OF POLYMERIC ACIDS BY IONIZATION. A. Katchalsky. Experientia *5*, 319-20 (1949). The swelling of a three-dimensional copolymer gel of methacrylic acid and divinylbenzene was studied. This gel swelled in alkali until 60% neutralized, after which the addition of alkali caused shrinkage. The shrinkage capacity decreases with increasing degree of cross linking.

Materials

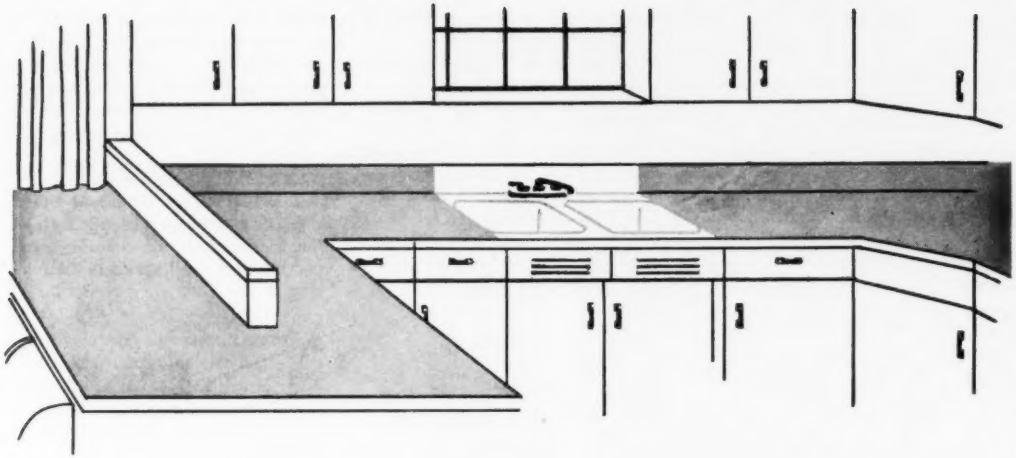
PLASTICIZING CRYSTALLINE POLYMERS. C. B. Havens. Ind. Eng. Chem. *42*, 315-19 (Feb. 1950). Methods used for the evaluation of plasticizers in vinylidene chloride copolymers are presented. Equations are derived which express plastics properties as a function of plasticizer concentration. For each plasticizer three constants, K_r, K_m, and K_i, are determined. These constants express plasticizer effectiveness in reducing melt viscosity, modulus or stiffness, and flex temperature, respectively. The effect of copolymer composition upon plasticizer compatibility and effectiveness is shown. Impact, tensile strength, and elongation data are presented.

PLASTICIZERS FOR POLYVINYL CHLORIDE. F. Kainer. Brit. Plastics *21*, 677-84 (Dec. 1949). The properties of plasticizers for polyvinyl chloride are reviewed. 61 references.

"ALKATHENE" LAY-FLAT TUBE. Plastics (London) *14*, 10-11 (Aug. 1949). The properties and uses of polyethylene tubing are described.

SUITABILITY OF TETRACHLOROPHTHALIC ACIDS FOR THE PREPARATION OF ALKYD AND MODIFIED ALKYD RESINS. H. Brintzinger, K. H. Lochner, and H. Noeske. Farben, Lacke, Anstrichstoffe 3, 249-51 (1949);

*Reg. U. S. Pat. Office.



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SYNTHETIC RESINS • CHEMICAL COLORS • PHENOLIC PLASTICS • NDUSTRIAL CHEMICALS

Chem. Abstracts *43*, 8733 (Nov. 10, 1949). The synthesis of resins from tetrachlorophthalic and nitrophthalic acids is described. Many of these products are water resistant and are compatible with styrene, chlorinated rubber, polyvinyl chloride, cellulose acetate butyrate, polyvinyl acetate, benzylcellulose, cellulose acetate, cellulose nitrate, and ethylcellulose.

CROSS-LINKING OF CELLULOSE ESTERS. T. Urbanski. Bull. Soc. Chem. Belges *57*, 467-8 (1948); Chem. Abstracts *43*, 8672 (Nov. 10, 1949). The cross-linking of cellulose acetate and cellulose nitrate with sulfonyl chloride is described.

INFLUENCE OF RESIN BONDS ON THE WATER-IMMERSION STABILITY OF PAPER-BASE LAMINATES. M. P. Seidel. Tappi *32*, 374-7 (1949). Various phenolic resins were prepared and used to make paper laminates. The moisture resistance of the laminate was independent of laminating temperature if the resin was cured. The low viscosity, low molecular weight resins penetrated the paper better and consequently gave better water resistance.

Applications

SYNTHETIC RESINS IN THE TANNERY. Brit. Plastics *21*, 641-5 (Dec. 1949). The uses of synthetic resins in tanning, for impregnating leather, and for coating leather are reviewed.

"NON-STRUCTURAL" APPLICATIONS OF HONEYCOMB. G. May. Plastics (London) *15*, 3-6 (Jan. 1950). Paper-plastic honeycomb materials are used for grilles, ventilators, growing seedlings, packaging, insulation, display devices, and decorative effects.

RECENT ADVANCES IN SURGICAL PLASTICS. G. Blaine. Brit. Plastics *22*, 54-60 (Feb. 1950). Applications of various types of plastics in surgical devices are described. Methyl methacrylate plastic is used to fill in bone losses, to fill lung cavities, for articulating caps in joints, for splints, and for spinal supports. Polyvinyl alcohol is used as a substitute for blood plasma, for local penicillin applications, for excoriations, for sponges, for cavity fillers, and for exclusive dressings. Polyvinyl chloride is used for patching wounded pleura, for internal tubes, and wrappings for injured tendons. Polyamides are used as sutures, tubes, and catheters. Polyethylene is used as a covering film in brain surgery, tubes in the urinary tract, for filling lung cavities, for lung wrappings, for repair of blood vessels, for repair of ruptures, for ducts, and for substitute bones. Thermosetting plastics are used for splints and in prosthetic devices.

Chemistry

IONIC POLYMERIZATION OF SOME VINYL COMPOUNDS. C. E. Schildknecht, A. O. Zoss, and F. Grosser. Ind. Eng. Chem. *41*, 2891-6 (Dec. 1949). The cationic polymerization of vinyl-type monomers is briefly reviewed. The polymerizations of lower alkyl vinyl ethers in different types of systems are discussed, particularly in relation to monomer structure and the properties of the vinyl ether polymers formed. A number of experiments are included bearing upon the kinetics of vinyl alkyl ether polymerization, and upon the nature of the isomerism in polyvinyl isobutyl ethers and in polyvinyl methyl ethers. Some observations of cationic polymerization of vinyl methyl ketone, N-vinylpyrrolidone, N-vinylcarbazole are made.

INTRAMOLECULAR CONDENSATIONS IN VINYL COPOLYMERS. T. Alfrey, Jr., C. Lewis, and B. Magel. J. Am. Chem. Soc. *71*, 3793-5 (Nov. 1949). An expression is derived for the amount of lactonization to be expected in a copolymer containing hydroxyl and carboxyl groups.

PYROLYSIS OF POLYMERS. W. S. Penn. Plastics (London) *15*, 18-21 (Jan. 1950). The literature on the pyrolysis of natural rubber, synthetic rubbers, polystyrene, polyisobutylene, polyethylene, polyesters, and other related polymers is reviewed. 25 references.

Molding and Fabricating

INJECTION MOLDING OF DERATING MATERIALS. J. C. Stokes and A. R. Morse. S.P.E. J. *6*, 3-7 (Feb. 1950). The rated capacities of injection molding machines and the factors affecting the design of a heating cylinder are discussed. The design of a satisfactory heater and spreader, the operation of these devices, and the results of tests with them are described. Particular emphasis is placed on the molding of styrene.

EXTRUSION OF NYLON. C. P. Fortner. Brit. Plastics *21*, 658-61 (Dec. 1949). The process of extruding nylon, the properties of extrusion compounds, and applications of the extruded products are reviewed.

SOME SUGGESTED IMPROVEMENTS FOR INJECTION MOLDING MACHINES. E. E. Mills. S.P.E. J. *6*, 17-18 (Jan. 1950). Improvements in injection molding machines are suggested by a molder.

RECENT DEVELOPMENTS IN COMPRESSION MOLDING OF THERMOSETTING MATERIALS. S. D. Hiltebrandt. S.P.E. J. *6*, 18-21 (Jan. 1950). The latest developments in compression molding techniques are reviewed.

Testing

COATINGS. T. G. Rochow and R. W. Stafford. Analytical Chem. *22*, 206-10 (Feb. 1950). Developments in the analytical chemistry of organic coatings and related resinous products are reviewed. 105 references.

NATURAL AND SYNTHETIC RUBBERS. N. Bekkedahl. Analytical Chem. *22*, 253-64 (Feb. 1950). Developments in the analytical chemistry of natural and synthetic rubbers are reviewed. 266 references.

HOT PENETRATION TEST FOR POLYVINYL CHLORIDE COMPOSITIONS. J. W. Clarke. Brit. Plastics *21*, 656-7 (Dec. 1949). Polyvinyl chloride compositions for use in electrical insulating materials are required in England to pass a hot penetration test. This consists of hanging a loaded wire along the length of a strip of the material which is supported by a mandrel at an elevated temperature. The indentation made by the wire after 48 hr. is measured.

VISCOMETER FOR THICK LIQUIDS. N. A. de Bruyne. Brit. Plastics *21*, 590-3, 626 (Nov. 1949). A viscometer for measuring the viscosity of viscous liquids is described.

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U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

CONDENSATE. J. D. Danforth (to Universal Oil). U. S. 2,495,890, Jan. 31. Resinous reaction product of a carbonyl compound and N-butenylaniline.

DIP TANK. J. E. Goldston (to Castalox). U. S. 2,495,961, Jan. 31. Plastic dip tank.

THERMOPLASTIC MOLDS. R. R. Myers. U. S. 2,496,014, Jan. 31. Apparatus for forming thermoplastic molds for use in electroplating.

CONDENSATE. E. L. Kropa (to American Cyanamid). U. S. 2,496,097, Jan. 31. Reaction product of an aldehyde and a modified triazine.

PLASTIC WORKING APPARATUS. S. E. Brillhart (to Western Electric). U. S. 2,496,147, Jan. 31. Apparatus for working plastic material comprising a helical advancing feed screw.

POLYMERIZATION. E. C. H. Kolvoort and G. Akkerman (to Shell). U. S. 2,496,222, Jan. 31. Forming a non-acidic emulsion of a vinylidine compound in water with an emulsifying agent and an alkali metal salt of a hydrocarbon sulfate and introducing with peroxy catalyst into a polymerization zone.

DISPERSION. J. Overhoff and H. W. Huyser (to Shell). U. S. 2,496,226-7, Jan. 31. Process for producing dispersions of high molecular weight reaction products of a dihalogen substituted paraffin and an alkaline polysulfide.

ACRYLONITRILE. D. W. Chaney (to American Viscose). U. S. 2,496,267, Feb. 7. Copolymer of acrylonitrile and vinyl acetate dissolved in acetonitrile.

POLYMERIZABLE ESTERS. J. A. Cottrell, D. H. Hewitt, F. Armitage, E. Booth, and R. H. Buckle (to Sherwin Williams). U. S. 2,496,271, Feb. 7. Polymerizable ester of allyl alcohol and a Diels-Alder condensate of maleic acid and a monocyclic conjugated terpene.

POLYMERS. J. B. Dickey (to Eastman Kodak). U. S. 2,496,275, Feb. 7. Copolymer of the vinyl ester of maleamic acid and vinyl acetate.

PLASTICIZER. R. E. Christ (to U. S. Industrial Chemicals). U. S. 2,496,335, Feb. 7. A dialkyl silane derivative of ricinoleic acid ester useful as a plasticizer for nitrocellulose.

PLASTICIZER. K. A. Earhart (to U. S. Industrial Chemicals). U. S. 2,496,340, Feb. 7. A trialkyl silane derivative of ricinoleic acid ester.

EMULSION POLYMERIZATION. W. L. J. de Nie (to Shell Development). U. S. 2,496,384, Feb. 7. Polymerization of vinylidene compounds with a copolymerizable monomer continuously in aqueous emulsion.

POLYVINYL ACETAL. E. Lavin, A. T. Marinaro and W. R. Richard (to Shawinigan Resins). U. S. 2,496,480, Feb. 7. Polyvinyl butyral stabilized by removing substantially all sulfur from the sulfuric acid catalyst.

EXTRUSION. G. E. Henning (to Western Electric). U. S. 2,496,625, Feb. 7. Apparatus for advancing plastic material for extrusion.

POLYMERIZATION. I. Allen, Jr., W. R. Marshall, and G. E. Wightman (to Union Carbide). U. S. 2,496,653, Feb. 7. Continuous process for polymerizing styrene.

COMPOSITE SHEET. W. A. Hermanson. U. S. 2,496,665, Feb. 7. Transparent sheet comprising a paper web of randomly deflocculated synthetic organic fibers and impregnated with a transparent polymerized synthetic resin.

COPOLYMER. J. R. Meadow and A. A. O'Kelly (to Socony-Vacuum Oil). U. S. 2,496,669, Feb. 7. Copolymerizing styrene and thiophene in the presence of hydrogen fluoride.

VINYL RESINS. G. J. Bohrer (to G. E.). U. S. 2,496,852, Feb. 7. Strong film comprising polyvinyl chloride plasticized with di-(2-ethylhexyl) tetrachlorophthalate.

EMULSION POLYMERIZATION. E. F. Fiedler and G. R. Lucas (to G. E.). U. S. 2,496,864, Feb. 7. Heating emulsified mass of styrene, water, an alkali metal hydroxide, a fatty acid, and a 1-hydroxycyclohexyl hydroperoxide-1).

POLYMER. R. G. Flowers (to G. E.). U. S. 2,496,868, Feb. 7. A 3-vinylpyrene polymer.

LAMINATES. L. B. Green (to Shellmar). U. S. 2,496,911, Feb. 7. Apparatus for forming laminates.

POLYESTERS. J. R. Caldwell (to Eastman Kodak). U. S. 2,496,933, Feb. 7. Heating a mixture of hydroquinone, a saturated aliphatic glycol, and a dicarboxylic acid.

ADHESIVE. C. M. Carson (to Wingfoot). U. S. 2,496,934, Feb. 7. A nondrying adhesive comprising a polyester of a dihydric alcohol with a dimer of a fatty acid and a resinous cyclized rubber.

COPOLYMERS. A. M. Clifford (to Wingfoot). U. S. 2,496,935, Feb. 7. Copolymers of terpinyl methacrylate interpolymerized with butadiene-1,3.

RUBBER HYDROCHLORIDE. J. E. Snyder (to Wingfoot). U. S. 2,496,963, Feb. 7. Method for heat-sealing rubber hydrochloride.

WAX. K. L. Berry (to Du Pont). U. S. 2,496,978, Feb. 7. A polytetrafluoroethylene wax.

POLYETHYLENE. M. E. Cupery (to Du Pont). U. S. 2,496,989, Feb. 7. Polyethylene composition containing a salt of an N-monoalkyl substituted polymeric amic acid.

DISPERSIONS. R. B. Killingsworth and R. S. Sheie (to Socony-Vacuum Oil). U. S. 2,497,045, Feb. 7. A solid thermoplastic vinyl resin dispersed in a petroleum hydrocarbon oil and capable of fusion into a continuous phase.

FLUORINATION. E. L. Kropa (to American Cyanamid). U. S. 2,497,046, Feb. 7. Fluorinating a synthetic aliphatic halogenated polymer.

(*Continued on p. 110*)

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CATION ACTIVE RESINS. H. M. Day (to American Cyanamid). U. S. 2,497,054, Feb. 7. A water-insoluble resin prepared by condensing 4,4'-dihydroxydiphenyl sulfone and formaldehyde in the presence of an alkaline sulfiting agent, curing, and granulating.

RESIN. J. R. Dudley and J. A. Anthes (to American Cyanamid). U. S. 2,497,073, Feb. 14. Heating formaldehyde and N-methylaniline hydrochloride and then reacting with dicyandiamide.

RESIN. J. R. Dudley and J. A. Anthes (to American Cyanamid). U. S. 2,497,074, Feb. 14. Urea-formaldehyde resin chemically reacted with a water-soluble product of dicyandiamide and an amine-aldehyde compound.

POLYMERS. K. H. Weber (to Armstrong Cork). U. S. 2,497,107, Feb. 14. Polymerizing a conjugated diolefin in the presence of an alkyl ester of mercaptyl undecanoic acid.

HOLLOW BODIES. E. V. Fejmert. U. S. 2,497,160, Feb. 14. Machine for making hollow bodies of plastic material.

COPOLYMERS. M. M. Brubaker, J. R. Roland, and M. D. Peterson (to Du Pont). U. S. 2,497,291, Feb. 14. Copolymer of vinyl chloride and ethylene.

POLYMERS. D. J. Loder and W. F. Gresham (to Du Pont). U. S. 2,497,-315, Feb. 14. Solid polymers prepared from glycols and 1,3-dioxolane.

POLYMERIZATION. M. J. Roedel (to Du Pont). U. S. 2,497,323, Feb. 14. Heating ethylene in the presence of a tertiary alkyl percarboxylate and under pressure.

COLORING PLASTIC. H. M. Collins (to Reliable Plastics, Ltd). U. S. 2,497,346, Feb. 14. Coloring pulverized non-porous plastic by tumbling with pulverized coloring matter and a low boiling organic liquid solvent and removing said solvent.

COATING. S. S. Gutkin (to Falk and Co.). U. S. 2,497,449, Feb. 14. Reacting acid thermoplastic natural resin, fatty acid glyceride, and pentaerythritol in the presence of a saponifying agent.

LAMINATES. A. D. F. Toy (to Victor Chemical). U. S. 2,497,637, Feb. 14. Laminate comprising layers of fabric laminated with a polymeric alkenyl ester of an arylphosphonic acid.

COPOLYMERS. A. D. F. Toy (to Victor Chemical). U. S. 2,497,638, Feb. 14. Copolymers of methyl methacrylate and alkenyl diesters of alkenylphosphonic acids.

COPOLYMERS. J. H. Werntz (to Du Pont) U. S. 2,497,705, Feb. 14. Copolymers of an N-vinyl lactam and an ester of a nomocarboxylic acid.

POLYMERIZATION. J. H. Young (to Du Pont). U. S. 2,497,828, Feb. 14. Polymerizing vinyl acetate in aqueous emulsion in the presence of hydrogen peroxide and formaldehyde sulfoxylate.

ELASTOMER. D. Josefowitz (to Publicker Industries, Inc.). U. S. 2,497,833, Feb. 14. A hard rubbery non-sticky transparent copolymer of butadiene-1, 3 and tetra-aryl succinodinitrile.

RESINS. H. A. Bruson (to Rohm and Haas). U. S. 2,497,926, Feb. 21. Reacting a polymer of 1-hydroxy-1,3-butadiene and an aliphatic monocarboxylic acid with a basic nitrogen compound whereby an insoluble infusible resin is formed.

FUNGICIDAL RESINS. H. A. Bruson (to Rohm and Haas). U. S. 2,497,927, Feb. 21. A resinous fungicidal agent comprising the copolymer of maleic or chloromaleic anhydride and a chlorinated aryl unsaturated ether.

RESINS. W. D. Niederhauser and H. A. Bruson (to Rohm and Haas). U. S. 2,497,955, Feb. 21. Condensing glycerol, decamethylenediamine, and 2-(β-carboxyethyl)-2-ethylhexaldehyde.

POLYESTER. D. W. Young and J. P. Rocca (to Standard Oil Development). U. S. 2,497,968, Feb. 21. Reacting methyl dilinoleate with decamethylene glycol in the presence of zinc dilinoleate to produce a resin.

HIGH FREQUENCY BONDING. F. H. Brown (to United Shoe Machinery). U. S. 2,498,027. Feb. 21. Device for bonding shoe parts with thermoplastic cement in a high frequency field.

NOVELTY. J. E. Feldman (to U. S. Rubber). U. S. 2,498,074, Feb. 21. Forming large objects inside a large container with a small orifice by molding polyvinyl chloride resin containing a blowing agent into a miniature of the object, inserting into the container, heating and thereby blowing into the expanded form.

INTERPOLYMERS. J. G. Kuderna, Jr. and R. H. Snyder (to U. S. Rubber). U. S. 2,498,084, Feb. 21. Copolymer of a di-2-alkenyl fumarate and a chlorinated alkene.

INTERPOLYMERS. P. O. Tawney and J. G. Kuderna, Jr. (to U. S. Rubber). U. S. 2,498,099, Feb. 21. Interpolymers of styrene, fumaric esters, and chlorinated alkenes.

POLYMERS. S. A. Ballard, R. C. Morris, and J. L. Van Winkle (to Shell Development) U. S. 2,498,195, Feb. 21. Polymerizate of amino alkyleneoxide.

CELLULOSE ETHER. A. L. Houk and L. H. Bock (to Rohm and Haas). U. S. 2,498,208, Feb. 21. Alkali-soluble cellulose ether formed by reacting alkalicellulose with isobutylene oxide is insolubilized by treating with solution of water-soluble cobalt salt and heating.

POLYMERIZATION. B. T. D. Sully (to A. Boake Roberts Ltd.). U. S. 2,498,226, Feb. 21. Polymerization of a substance having a terminal methylene group in the presence of a sulfite or sulfur dioxide, oxygen, and a metal salt which catalyzes sulfite oxidation.

RESISTANCE COMPOSITION. L. J. Berberich and W. W. Pendleton (to Westinghouse). U. S. 2,498,238, Feb. 21. Resistance composition composed of an oil-modified alkyd resin, acetylene black, and a volatile solvent.

PLASTIC COMPOSITION. A. A. Schaerer (to Shell Development). U. S. 2,498,453, Feb. 21. Vinyl halide polymer plasticized with sulfuric-acid-treated high-boiling petroleum extract.

POLYMERS. E. A. Kern and R. K. Abbott, Jr. (to G. E.). U. S. 2,498,-474, Feb. 21. Polymeric monovinyldibenzofuran.

ELASTOMERS. R. T. Dean (to American Cyanamid). U. S. 2,498,-532, Feb. 21. Copolymer of 1,3-butadiene and acrylonitrile or polyvinyl

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Unicolor does not affect the physical or chemical properties of the plastic with which it is used; does not interfere with normal extrusion rates; does *not* produce "blisters" and blemishes on the surface of extruded products; does not mottle, streak or bleed; unlike dry powders, does not fly around and contaminate other machines; cannot clog screens.

How Can Unicolor Be Tested?

Unicolor test samples are available for your own extruder. Results will show at first hand how much can be saved with Unicolor and plain resin in place of precolored plastics. Send requests for free samples, details, and prices to Unicolor Division, Westchester Plastics, Inc., Mamaroneck, New York.

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chloride plasticized with dibutyl dihydracrylate.

RESINS. L. H. Dimpfl (to California Research). U. S. 2,498,533, Feb. 21. Condensate of a linear condensate of cyclohexadiene dicarboxylic acid having conjugated unsaturation and a dihydric alcohol, diamine, or amino-alcohol; and a linear condensate of an unsaturated dicarboxylic acid with dihydric alcohol, diamine, or alcohol-amine.

SYNTHETIC FIBER. G. E. Ham (to Monsanto) U. S. 2,498,605, Feb. 21. Fiber comprising the reaction product of maleic anhydride and a polymer of acrylonitrile.

POLYSTYRENE. W. S. Emerson (to Monsanto) U. S. 2,498,616, Feb. 21. Heating styrene and an unsaturated aryl nitrile substituted ester to form a resinous product.

POROUS COMPOSITION. E. L. Kropa, L. E. Craig, and A. S. Nyquist (to American Cyanamid). U. S. 2,498,-621, Feb. 21. Cellular, cured water-insoluble product comprising an unsaturated alkyd resin containing end groups, a vinylidene compound, cellulose acetate butyrate, and a gas-liberating material.

LAMINAR STRUCTURE. L. E. Daly (to U. S. Rubber). U. S. 2,498,652, Feb. 28. An elastomeric copolymer sheet bonded by heat to a thermoplastic composite of the same elastomer and a copolymer.

DISPERSIONS. W. C. Mast (to U. S.). U. S. 2,498,694, Feb. 28. Producing sprayable or brushable aqueous resin dispersion by polymerizing a lower alkyl acrylate alone or with acrylonitrile in the presence of a wetting agent, a peroxide, ammonia, and ammonium alginate.

Correction

In the article "Manufacture and Use of Polyethylenimine in Germany" in the November 1948 issue of Modern Plastics, the height of drop of the steel ball mentioned in the second paragraph under "Preparation of polyethylenimine" on page 131 should be 20 cm. rather than 20 mm. This error also occurs in the PB report 12467 referred to in the same paragraph.

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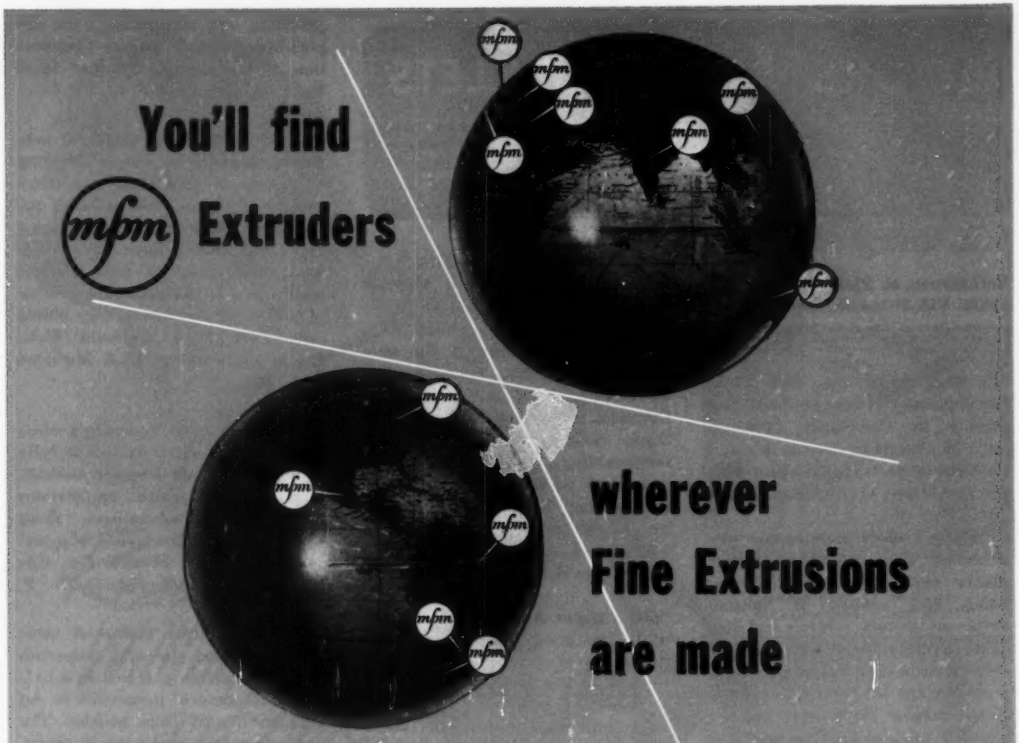

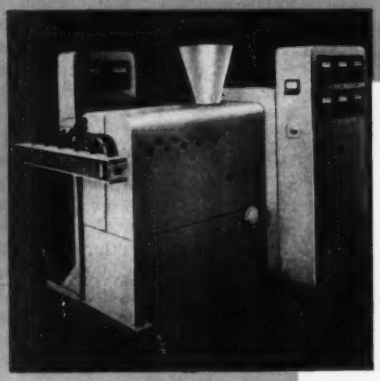

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Techniques of Plant Maintenance —1950. Vol. I and II."

Published by Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. 278 pages. Price $2.00 for both volumes.

Proceedings of the first Plant Maintenance Conference—held last January in Cleveland, Ohio—in which 30 experts in various fields of maintenance participated along with 8000 executives, are reported in this text.

Subjects include maintenance organization and principles; maintenance costs and budgeting; selection and upkeep of lighting equipment, motors, controls and distribution machinery; use of electrical instruments; sanitation and housekeeping; lubrication; application of service equipment; protection of plant and worker; and the importance of maintenance to safety.

The second volume contains answers to over 500 questions submitted by the audience.

"Chemical Engineers' Handbook," by John H. Perry, in collaboration with E. I. du Pont de Nemours & Co., Inc.

Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. 1884 pages. Price $15.00.

A comprehensive coverage of both standard and recently compiled facts, figures, and methods applicable to chemical engineering and its related fields is the scope of this completely revised third edition.

Over 2000 charts, diagrams, cross-sections and flow sheets accompany the text.

"Developments in the Wear Resistance of Textiles."

Published by the Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. 353 pages. Price $5.00.

This collection of 19 key papers on textiles and related subjects, published in Germany during the war, was compiled at the request of the U. S. Army European Command to summarize significant German researches on fiber behavior.

During the war Germany gave considerable attention to the serviceability of textile materials. Cut off from peace-time imports, the Germans were forced to use synthetic materials of lower general serviceability than natural fibers, and it was necessary to make these textiles last longer. Supplemented by illustrations, comprehensive tables, and charts, the translated papers give details on this research.

"The Fatigue Allowance in Industrial Time Study," by Matthew A. Payne.

Published by Matthew A. Payne, 13777 Euclid Ave., E. Cleveland, Ohio. 66 pages. Price $2.50.

An important industrial labor-relations problem—that of the fair day's work—is discussed in this book, which takes up the purpose, determination, and application of the fatigue allowance in industrial time study. The text contains many industrial engineering opinions on the fatigue allowance and its effect upon workloads, fair day's work, man power, incentive assignments.

Cosmetic manual—Information on how to use raw materials in cosmetic formulations is contained in this 20-page booklet. Glyceryl monostearates, diglycol stearates, and diglycol laurates are among the company's products described. Complete formulas for many types of cosmetics are given including those for emulsions, cold creams, absorption base creams, mascara, and liquid stocking preparations. *Glyco Products Co., Inc., 26 Court St., Brooklyn, N. Y.*

Guide for the prospective exporter—Designed especially for the small businessman interested in trading under the Marshall Plan, this 51-page guide on international trade deals with questions of markets, products, and requirements for export operations. *Economic Cooperation Administration, Office of Small Business, Washington 25, D. C.*

Manual of practical employer-employee communications—Covering all phases of good plant and community relations, this manual reviews existing media for achieving a successful employer-employe communications program, from word of mouth and house organs to motion pictures. Non-members may obtain copies for $1.50. *National Metal Trades Association, 222 S. Michigan Ave., Chicago 3, Ill.*

Thy-mo-trol—The company's electronic motor control system is fully explained in this 20-page booklet. Information includes applications and operation advantages, along with charts of dimensions of components. *General Electric Co., Apparatus Dept., Schenectady, N. Y.*

Protective coating resins—A table of physical and chemical properties of Poly-pale resin, as well as a listing of its general properties, is set forth in this 20-page booklet. The text covers the resin's use in esters, maleic-modified and phenolic-modified resins, and in varnishes, metal resinates, gloss oils, tung oil varnishes, and tung oil limed rosin varnishes. *Hercules Powder Co., Wilmington, Del.*

Molding powders—Designed for use by molders and manufacturers of plastics products are two folders on polystyrene and cellulose molding powders. These brochures contain technical information concerning properties and uses, together with charts and other pertinent material. *American Molding Powder and Chemical Corp., 44 Hewes St., Brooklyn 11, N. Y.*

Resorcinol (Bulletin C-9-124)—Describing the physical and chemical nature, uses and reactions of Koppers resorcinol, this 40-page technical bulletin is a revision and enlargement of a previous report. Discussed are the uses of resorcinol to increase the adhesion between rubber and textiles and its role in the preparation of dye-stuffs, explosives, and pharmaceuticals. Other uses outlined for the product are:

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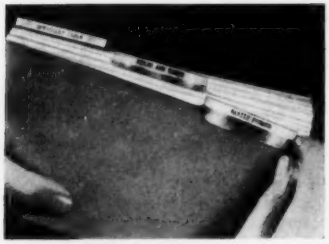

INDEX TABS.
Material: Kodapak I Sheet, clear.
Suggested gauges: .003″ to .015″.

BADGE HOLDERS.
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Suggested gauges: .005″ to .010″.

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Material: Kodapak I Sheet, clear.
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preparation of cosmetics; fur dyes and treatments; paints and varnishes; plastics stabilizers and plasticizers; synthetic resin adhesives; tanning agents; thermosetting plastics; and as an analytical reagent or as an antioxidant.

Technical information includes physical properties and crystallographic, spectral, and thermodyanamic data. *Chemical Div., Koppers Co., Inc., Pittsburgh 19, Pa.*

Laboratory report—Over 700 analyses of household and automotive chemical specialities are made available in this brochure designed to enable manufacturers to keep up with current information on the composition and nature of new products. *Chemical Specialties Research Laboratories, Box 33, Ansonia Station, New York 23, N. Y.*

Packaged-unit spray dryers—Complete information on the design and uses of a new spray-drying tower are set forth in this eight-page booklet. Models available have diameters of 8, 9, and 10 ft., and capacities ranging from 500 to 1500 lb. of water per hour. Representative cost and performance data are also presented with details of arrangements available for test runs. *Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.*

Oil data sheet No. 1-IL—Specifications, uses and advantages of Safco No. 1250, a new light-colored, carbon-free, high-temperature lubricating oil, are set forth in this data sheet. Developed to meet the demand for a lubricant for ball and roller bearings, which are constantly subjected to severe operating temperatures, the product has been heat-treated for greater resistance to gum, carbon, or sludge formations. *Swan-Finch Oil Corp., 30 Rockefeller Plaza, New York 20, N. Y.*

Management releases—Four checklists of recent publications in the fields of personnel management and industrial relations, factory and office production, sales management, marketing and packaging, and office and financial management are now available. More than 160 research studies, monographs, and pamphlets are listed. These publications give explanations and analyses of operating techniques, procedures, policy determination, company case histories, and the management experience of leading organizations. *American Management Association, 330 West 42nd St., New York 18, N. Y.*

Resin guide—Designed to keep the formulator up-to-date on the resins available from the company, this guide tabulates the specifications for these resins manufactured for use in paints, varnishes, lacquers, and printing inks. Outlined are the various grades in each of the melamine, urea, alkyd, copolymer, phenolic, and dibasic-acid families. *Coating Resins Dept., American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.*

Conversion table (TDC-110)—A linear conversion table designed for engineers converts inches and fractions of inches into decimal parts of a foot. It is arranged on a single card. *The Babcock & Wilcox Tube Co., Beaver Falls, Pa.*

Battery technology handbook—A revised second edition of this 40-page handbook of technical instruction and engineering data on the care of motive-power storage batteries is now available. Included in a new section on the theory of the lead-acid battery are line drawings showing what goes on when a battery is charging and discharging. Information is given on specific gravity changes, positive and negative plate composition, and other battery operation principles. Four other subdivisions cover care and operation; maintenance and repairs; parts; and technical data. *Gould Storage Battery Corp., Trenton, N. J.*

Collapsible metal tubes—The versatility and advantages of the company's collapsible tubes and small plastic caps and specialties are outlined in this eight-page booklet. Capacity, size, and tolerance specifications are included. *A. H. Wirz, Inc., 2320 Townsend St., Chester, Pa.*

Facts for business policy—As a guide for businessmen, this consulting industrial research and engineering organization has described its services in a four-page booklet. These services include surveys on industrial diversification, distribution policies, potential markets, marketing effectiveness, trends, plant sites, project soundness, and regional development. *Arthur D. Little, Inc., 30 Memorial Dr., Cambridge 42, Mass.*

Durite—Phenolic molding compounds, industrial resins, and cements available to the trade under the Durite label are described in this eight-page booklet. Covering the various types of Durite products that are now being offered, the text analyzes the industries in which new and modified products might be utilized. *Chemical Div., The Borden Co., 350 Madison Ave., New York 17, N. Y.*

Industrial chemicals—Offering purchasing agents, production superintendents, and laboratory directors a compact description of the chemicals which are available to industry, this 42-page booklet includes specifications, properties, and typical uses. Listed are aliphatic acids and anhydrides; alcohols, plasticizers and solvents; phenols and phenol ethers; cellulose products; inorganic chemicals; and miscellaneous chemicals. *Tennessee Eastman Corp., Kingsport, Tenn.*

Polyamide resin suspensoids—Properties and suggested applications of the company's new cationic dispersions of polyamide resin in water are described in this eight-page data sheet. These resins are particularly recommended as heat-sealable coatings for paper, metal foils, plastic films, cloth, and leather. *General Mills Research Laboratories, 2010 East Hennepin Ave., Minneapolis, 13, Minn.*

Laboratory guide—The 41 members of the American Council of Commercial Laboratories, Inc., are indexed in this 48-page booklet which gives information on personnel, equipment, and services for leading independent testing, research, and inspection laboratories. *American Council of Commercial Laboratories, Inc.*

Heating system—Application of the Dowtherm heating system in process industries such as plastics, foods,

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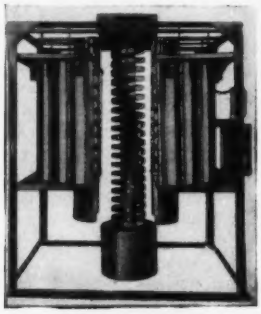

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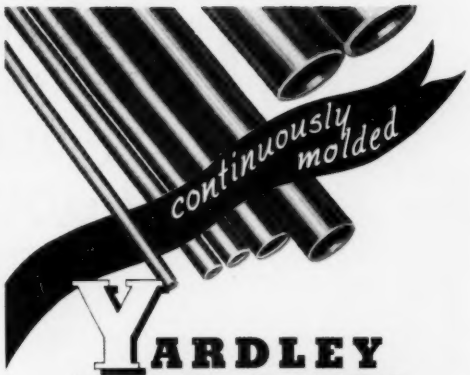

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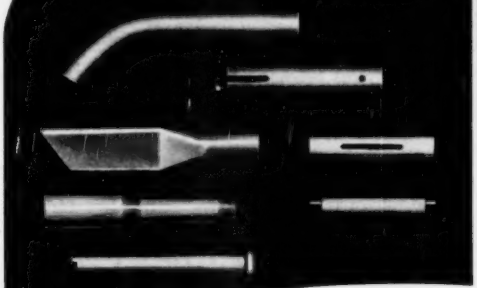

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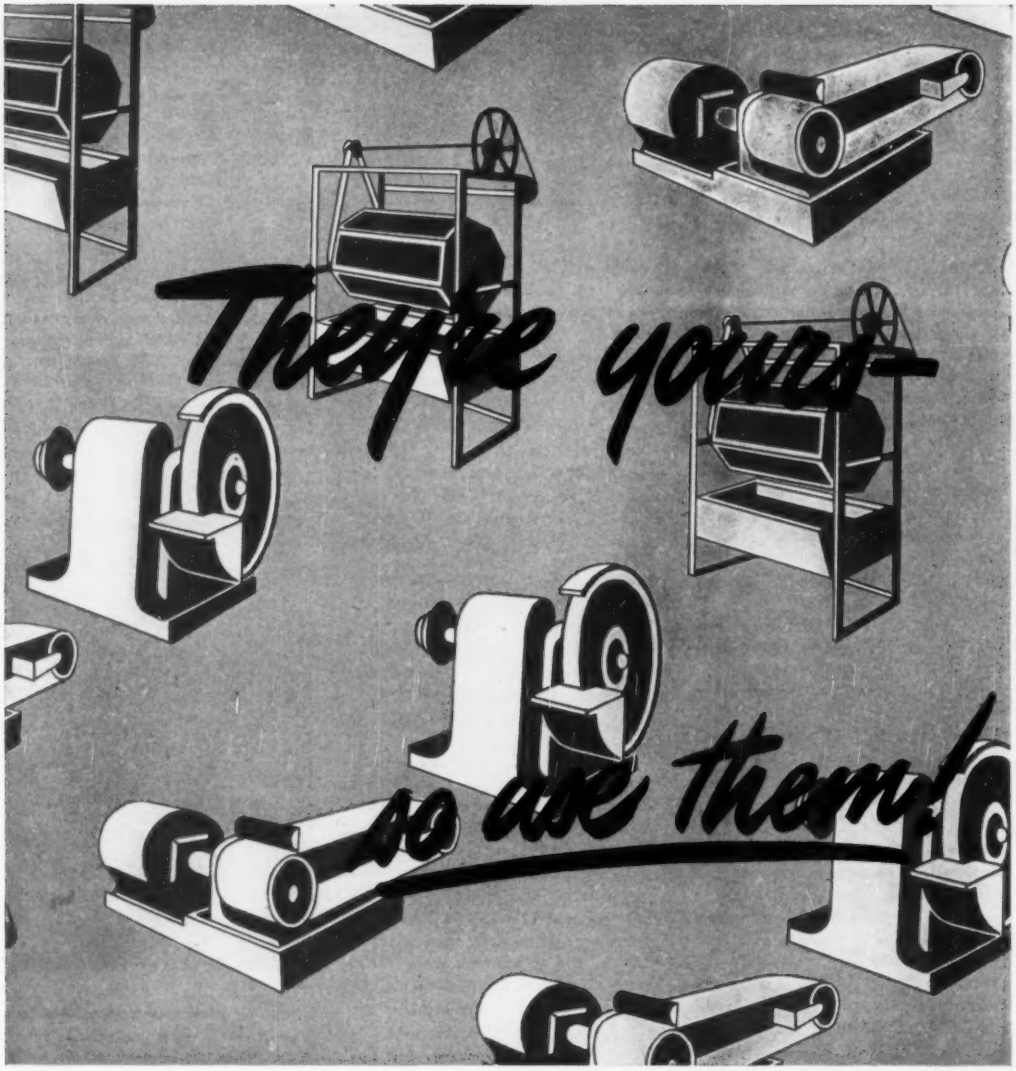
resins, chemicals, etc., is covered in this 32-page brochure which is based on the experience gained from the installation of more than 300 such systems. Divided into two major sections, the first part contains simplified flow diagrams, descriptions, and photographs of a representative group of processes while the second portion describes Dowtherm and the various methods of using it.

Processes using this system include deodorization of edible oils; fatty acid distillation and fractionation; oil bodying; castor oil dehydration; synthetic resin manufacture; esterification; catalyst heating and regeneration; and indirect air heating. *Foster Wheeler Corp., 165 Broadway, New York 6, N. Y.*

Actuating cylinders (Bulletin No. 500)—Dimensions and weights, ratings, and limitations of the recently announced line of medium-duty cylinders as well as heavy-duty and super-duty lines are given in this 12-page catalog. Information affecting the selection of pneumatic and hydraulic cylinders is included. *Ledeen Mfg. Co., 1600 So. San Pedro St., Los Angeles 15, Calif.*

Carbide tipped tools (Catalog No. 104)—Giving specifications and descriptions of the company's line, this 26-page booklet lists and illustrates taper shank drills, wire gage and letter size drills, glass and core drills, lathe centers, straight and taper shank chucking reamers, stub screw machine reamers, shell reamers, jobber reamers, machine countersinks, and dowel pin reamers. The care of these tools, as well as grinding information and suggested feeds and speeds when drilling or reaming various materials, are also covered. *Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.*

Plant lighting—A guide to improved plant lighting, covering the latest concepts of planned lighting, its benefits, and methods of employment, is presented in this 32-page brochure. The subject is handled from the management viewpoint, breaking the problem down into three parts: economics, program development, and equipment selection. *Benjamin Electric Mfg. Co., Des Plaines, Ill.*



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HARDNESS-SCRATCH TESTER—Measurement of surface toughness and scratch resistance of plastic or coated surfaces is the main objective of the Model 139 Sheer Hardness and Diamond Scratch Tester produced by Taber Instrument Corp., 136 Goundry St., N. Tonawanda, N. Y. Both tests are performed with a finely balanced scale beam on which divisions represent 10 gm. per graduation. A sliding weight provides an adjustment in load from 0 to 500 grams. An extra calibrated weight permits a load increase to 1000 grams. The scale beam is pivoted on precision ball bearings. The device may be operated in conjunction with accessories used on the Taber abrasion tester.

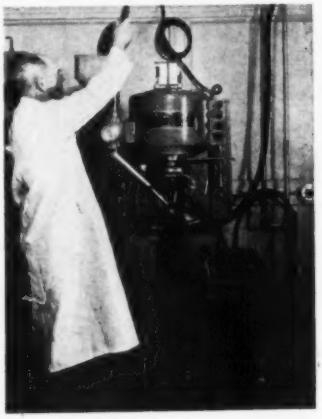
MOLDING CONTROL—Control of industrial furnace temperatures is the primary function of a new device, the Gardsman Controller (Model J), recently introduced by Taco West Corp., 525 N. Noble St., Chicago 22, Ill. Among the major applications of the unit is to plastic molding and extrusion machines, as well as control of torque, pressure, and vacuum. With certain mechanical features added to the standard circuit, the instrument becomes a program controller, automatically varying necessary changes in time and function of various industrial processes. It is readily adaptable for control of such specific problems as packaging, fluid flow, liquid level, viscosity, smoke, light, etc. Typical of the Gardsman's operation is its use as a pyrometric controller.

Highlights of the Model J include: line voltage of either 115 or 230; line frequencies of 50/60 cycles per sec.; over 30 standard ranges available on the pyrometer scale; fixed dampening; and accuracy to 0.75% of full scale.

FLUID PRESSURE BOOSTERS—Savings in space and weight are said to be significant when fluid power for working cylinders is supplied by a line of fluid pressure boosters designed by Miller Motor Co., 4027 N. Kedzie Ave., Chicago 18, Ill. Capable of developing working hydraulic output pressures up to 10,000 p.s.i. from ordinary plant air or hydraulic input pressures, the units are recommended specifically for such operations as clamping, punching, shearing, crimping, riveting, welding, and pressing.

In addition to performing work that might otherwise require an air cylinder 10 times as large and as heavy, the booster need not be mounted on the equipment itself, which permits flexible arrangement of working cylinders. The boosters hold pressures indefinitely without motion or heat generation. In operation, input pressure can be either air or hydraulic; output is always hydraulic. Operating speeds range from 30 to 450 strokes per minute.

HIGH-SPEED COMPRESSION PRESS—Development of the Multipress, a high-speed, automatic compression molding press which speeds production of thermosetting plastic pieces, has been announced by The Denison Engineering Co., 1186 Dublin Rd., Columbus 16, Ohio. Designed at the suggestion of Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio, the new equipment features fast die-closing action with exacting pressure control—factors which are of vital importance when molding quick-curing alkyd resin molding powder.



The Multipress provides for automatic feeding of granular powder to either single- or multiple-mold cavities; automatic dwell or curing time; electric heating of mold halves; and automatic injection of finished parts. To permit rapid closing, the unit has a downward ram speed of 500 in. per minute. It also has preset pressure control that assures precise duplication of pressure with each operating cycle.

Other highlights are electric control of raming cycle; connections and pilot lights for thermostatically controlled electric mold heating ele-

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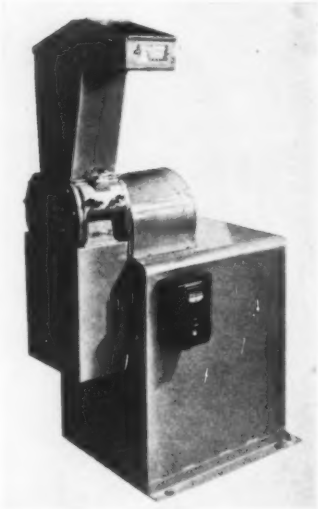
ments; completely self-contained; and manual control for molding operations which require positioning of inserts.

MIDGET CUTTER—Constructed for individual mounting alongside plastics injection molding machinery is a new-type table model midget cutter recently introduced by Ball & Jewel, Inc., 22 Franklin St., Brooklyn, N. Y. The unit, which has a throat opening measuring 5½ by 6 in., is designed principally to handle sectional thicknesses from ¼ to



½ inch. Said to be the smallest in the firm's line, the midget grinder has a capacity of 50 to 75 lb./hr., and is operated by a 1-hp. motor.

BLOW TORCH—Instantaneous lighting—without requiring pouring of fuel, pumping, or priming—features a new general-purpose blow torch introduced by Pressure Products Corp., 140 N. Dearborn St., Chicago 2, Ill. Designed for maintenance work and other operations requiring heat or flame, the torch is powered by a new self-pressurizing, self-vaporizing fuel. Both the fuel and the torch are marketed under the trade-name Prepo.

The Prepo fuel is packaged in a disposable metal container. It is compounded of several petroleum hydrocarbons blended to provide a pressure that is constant enough to continue until the fuel is expended. The container is sealed to the torch in such a way that when the valve is opened, the burning tip can be ignited merely by the application of a lighted match. A flame with more than 2200° F. heat is produced in from 30 to 60 seconds.

Two easily interchanged burning tips are provided with each torch: one throws a long, broad flame; the other has a long pin point flame for work that is done in more concentrated areas.

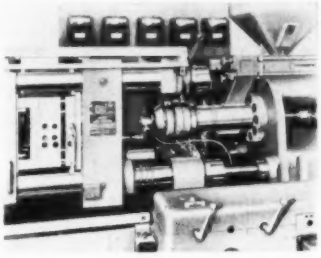
PRECISION SWITCH—To compensate for variation in working range tolerances of critical pressure and thermostatic controls and timing devices, a precision switch has been developed by Unimax Switch Div., The W. L. Maxson Corp., 460 W. 34 St., New York 1, N. Y. Known as the Unimax Type MX-1-Z25, the new device has an adjustable-movement differential which permits close setting of on-off cycles in control circuits. This motion may be fixed at any point within the range of 0.0005 to 0.008 inches. Adjustment is by means of a knurled knob on top of the switch body which raises or lowers the upper contact inside the switch.

NUMBER PRINTERS—A new machine that prints numbers on the peripheral face of counter, speedometer, and indicator wheels has been announced by The Acromark Co., 365 Morrell St., Elizabeth 4, N. J. When hand operated, the new unit is said to be capable of printing 9 to 12 wheels a minute, while motor drive increases speed to the rate at which an operator can feed pieces. Designated Acromark No. 42, the new equipment is complete with ink fountain that uses enamel or special printing ink. Figure-printing wheels are made of Acroprene synthetic, acid-resistant rubber, molded in precision rolls to precision steel hubs.

PRESS FEEDING VIBRATOR—As a standard equipment addition to its Model 741 completely automatic molding press, F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa., has announced a vibrator with controller for the press feeding device. The new vibrator provides either steady vibration to fill feed tubes in the loading assembly more densely, or intermittent vibration to facilitate clean dumping of feed tubes when the feeder assembly is directly over the die and in the unloading position.

TUMBLER-MIXER-GRINDER — Simultaneous mixing and grinding of liquids or powders is the major feature of the Tumblemixer, a heavy-duty tumbling machine manufactured by Crown Machinery & Equipment Sales Co., 2721 S. San Pedro St., Los Angeles, Calif. Powered by a ½-hp. motor, the unit can be used for plastics, chemicals, coloring, and paint with a minimum of handling and contamination. It weighs 375 lb., and is 7 ft. long, 28 in. wide, and 3 ft. high.

INJECTION MOLDING HEATER—Thermoplastic injection molding machines can be adapted for use in molding thermosetting products by the installation of a new injection molding heater. Developed by General Machine & Tool Works, Walled Lake, Mich., and distributed through Reed-Prentice Corp., Worcester 4, Mass., the new unit is particularly suitable for use with the



Reed-Prentice 10D-8 thermoset injection molding machine. The new equipment features elimination of preheating of material prior to placing it in the hopper, since the process includes controlled preheating in the machine's normal cycle. Molds also have controlled heat for final polymerizing or curing of the shot.

Other advantages claimed for the new equipment include close tolerances (dimensional accuracy can be maintained to within 0.001-in. limits); high density and strong pieces, resulting from high pressures up to 47,000 p.s.i.; light weight; and high production at low unit cost.

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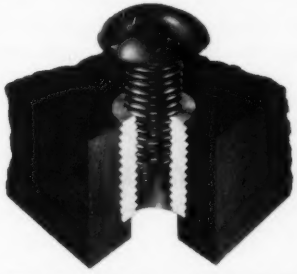

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(Pat.) tap their own threads into all types of plastics, wood and soft metals for increased shearing strength, when screws, bolts, studs, etc. are used under stress loads. Self-tapping segments securely lock inserts and screw fasteners in cored or drilled holes.

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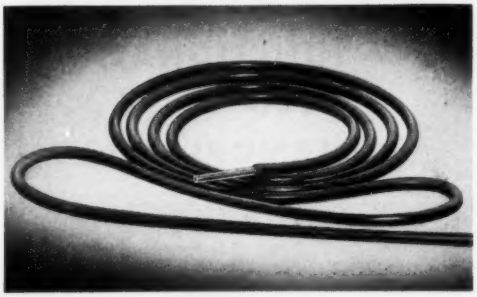

Meeting the growing demand for flexible tubing protected by plastic, Pyramid Plastics can now extrude a suitable plastic over your metal tubing according to specifications in small or large runs—the illustration here shows flexible metal control-cable coated with Geon, in use by an automotive parts manufacturer. It is waterproof and resists oil, grease, water, gasoline, abrasions, age. Instruments, electrical control manufacturers and many other producers of technical equipment are best served by tubing with these qualities of efficiency.

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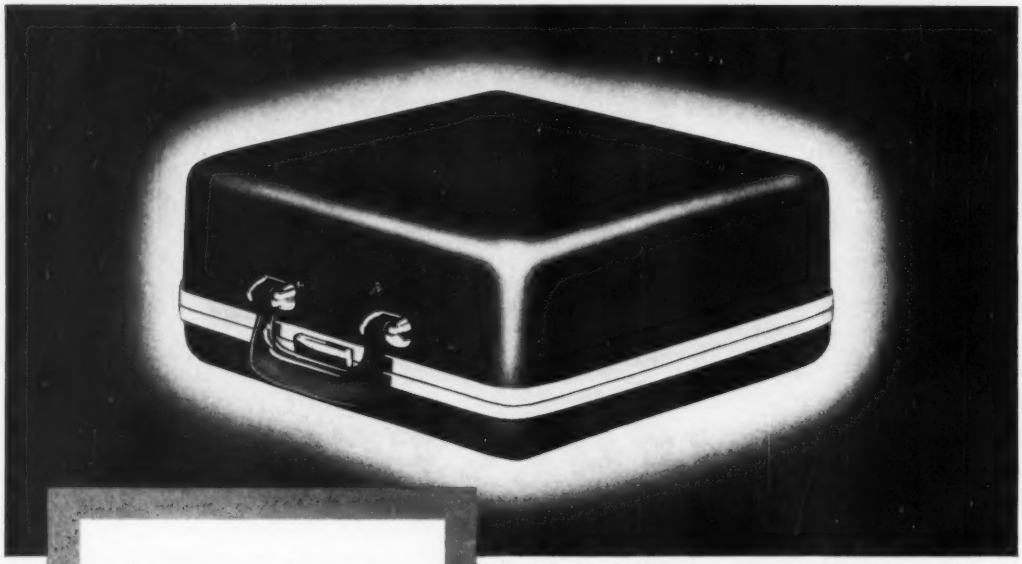

Typewriter case of Royalite made for the Smith-Corona Portable

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Pikes Peak Plastic
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Plasticraft Co., 2806 N. Speer Boulevard, Denver

CONNECTICUT
Colt's Mfg., Hartford 15

GEORGIA
Gladwin Plastics, 542 Courtland St., N. E., Atlanta

ILLINOIS
Arrem Plastic, 1539 North Throop St., Chicago 22
Croname Inc., 3701 Ravenswood Ave., Chicago 13
G. Felsenthal & Sons
4100-4118 West Grand Avenue, Chicago 51
Lamicoid Fabricators Inc.
4545 West Cortland Street, Chicago 39
Neo Products Co., 2534 South Kedzie, Chicago 23
Northwestern Plastics Inc.
2535 West Washington Boulevard, Chicago 12
Precision Plastic Products Inc.
628 West Lake Street, Chicago 6

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General Plastics Corp., 1400 N. Washington, Marion
Plastic Mfg. & Designer Corp.
422 West 9th Street, Indianapolis 6

MARYLAND
Fawn Plastics Co., 2902 Hamilton Ave., Baltimore 14

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Cadillac Plastic Co., 651 W. Baltimore, Detroit 2
Detroit Macoid Corp., 12340 Cloverdale Ave., Detroit 4
Imperial Industries, 4435 Walker Avenue, Wayne
Klise Mfg. Co., 50 Cottage Gr. S. W., Grand Rapids 2
Woodall Industries Inc.
7565 East McNichols Road, Detroit 34

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Plastics, Inc., Chestnut and Ryan Streets, St. Paul 2

MISSOURI
Plastic Design Co., 322 Clark Avenue, St. Louis 2
Regal Plastics Co., 710 Main Street, Kansas City

NEW JERSEY
Thermacote Co., 320 Jefferson Street, Newark 5
Van Beck Industries, 23 Park Street, Orange
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10 W. Parker Ave., Maplewood

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Bassons Molded Products, 1424 W. Farms Rd., N. Y. C. 60
Blue River Plastics, 329 Canal St., N. Y. C. 13
Curbell Inc., 1700 Elmwood Avenue, Buffalo 7
Dual Fabricators Corp., 808 Driggs Ave., Brooklyn 11
Dura Plastics Inc., 1 West 34th Street, N. Y. C. 1
Steiner Plastics Mfg. Co.
47-30 33rd Street, Long Island City 1

OHIO
Fabri-Form Co., Box 36, Cambridge

OKLAHOMA
Magic Circle, 6224 East Admiral Place, Tulsa 15

PENNSYLVANIA
Lee Plastics, A and Lippincott St., Philadelphia 34
Halsen Mfg. Co., 5919 Webster St., Philadelphia

TEXAS
Glow-Lite Plastic Arts Co.
715 South Comal Street, San Antonio 5
Plastic Engineering Co., 2101 69th St., Houston 11
Plastic Products of Texas
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WASHINGTON
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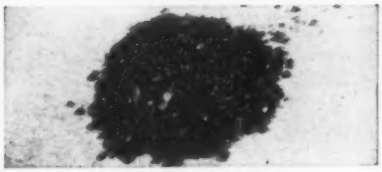

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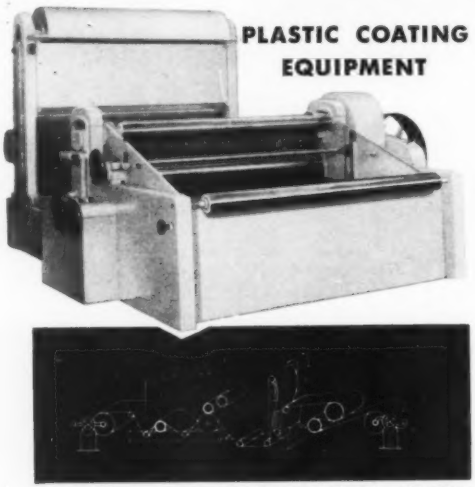

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FULTON, N. Y.

Production of

FOR THE purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant, for transfer to other plants

Materials	*Total prod'n first 2 mos. 1950*	*Total sales first 2 mos. 1950*
CELLULOSE PLASTIC:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, continuous:		
Under 0.003 gage	1,781,480	1,650,538
0.003 gage and over	1,286,363	1,280,322
All other sheets, rods and tubes	744,949	620,636
Molding and extrusion materials	10,785,980	10,335,789
Nitrocellulose		
Sheets	888,805	915,210
Rods and tubes	203,312[1]	188,662
Other cellulose plastics[b]	1,992,553	1,029,506
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	9,275,662[1]	5,985,394[1]
Adhesives	3,990,584[1]	3,670,147[1]
Molding materials[a]	33,263,763[1]	27,081,463[1]
Protective coatings (containing less than 10% modifier)	3,018,900	2,379,701[1]
Miscellaneous uses, including casting	8,266,693[1]	8,634,252[1]
UREA AND MELAMINE RESINS:		
Adhesives	10,325,659[1]	9,971,949[1]
Textile- and paper-treating resins	5,448,443[1]	4,590,983[1]
Protective coatings, modified and unmodified	3,820,039[1]	3,273,541[1]
Miscellaneous uses, including laminating and molding[c]	9,792,320[1]	8,471,393[1]
STYRENE AND STYRENE DERIVATIVE POLYMER AND COPOLYMER RESINS:		
Molding materials[a]	33,152,806	36,731,645
Miscellaneous uses[d]	7,420,314[1]	6,480,525[1]
VINYL RESINS:		
Sheeting and film, including safety-glass sheeting[a]	34,239,239[1]	29,212,794
Adhesive (resin content)	2,436,660	2,278,476[1]
Textile- and paper-treating resins, including spreader and calendering types (resin content)[e]	6,604,489[1]	6,181,573
Molding material (resin content)	17,439,848[1]	16,277,470
Miscellaneous uses (resin content)[e]	3,819,269[1]	2,205,235[1]
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a, f]	8,436,609	8,013,611[1]
Protective coatings[g]	11,559,585[1]	11,315,216[1]
All other uses[h]	32,680,245[1]	31,307,449[1]

[a] Includes fillers, plasticisers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Excludes data on protective coating resins; these data are included with miscellaneous coating resins to avoid disclosure of operations of individual companies. [e] Includes data for spreader and calender-

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

January 1950		February 1950	
Production	*Sales*	*Production*	*Sales*
860,000	838,264	921,480	812,274
668,832	657,973	617,531	622,349
409,015	323,446	355,934	297,190
5,387,154	5,098,068	5,398,826	5,237,721
444,266	452,634	444,539	462,576
101,639[1]	105,439[1]	101,673	83,223
824,595	941,881	1,167,958	1,087,625
4,648,034[1]	2,848,355[1]	4,627,628	3,137,039
1,996,723[1]	1,900,978[1]	1,993,861	1,769,169
16,899,922[1]	13,911,931[1]	16,363,841	13,169,532
1,484,287	1,175,619[1]	1,534,613	1,204,082
3,954,628[1]	4,058,378[1]	4,312,065	4,575,874
4,807,753[1]	4,630,253[1]	5,517,906	5,341,696
3,178,256[1]	2,663,291[1]	2,270,187	1,927,692
1,877,675[1]	1,594,838[1]	1,942,364	1,678,703
5,003,299[1]	4,294,678[1]	4,789,021	4,176,715
16,754,998	17,538,031	16,397,808	19,193,614
3,576,552[1]	2,995,294[1]	3,843,762	3,485,231
16,467,266[1]	12,330,635	17,771,973	16,882,159
1,198,028	1,105,652[1]	1,238,632	1,172,824
3,507,040[1]	2,871,806	3,097,449	3,309,767
9,756,434[1]	7,935,598	7,683,414	8,341,872
2,181,991[1]	1,199,970[1]	1,637,278	1,005,265
4,513,761	4,023,526[1]	3,922,848	3,990,085
6,240,039[1]	6,154,449[1]	5,319,546	5,160,767
16,582,708[1]	15,808,777[1]	16,097,537	15,498,672

ing type resins. [2] Includes data for acrylic, polyethylene, nylon, and other molding materials. [3] Includes data for coumarone-indene, petroleum, silicone, and other protective coating resins. [4] Includes data for acrylic, alkyd, coumarone-indene, nylon, petroleum, silicone, and other plastics and resins for miscellaneous uses. [1] Revised.

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DETECTO SCALES

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DETECTO-GRAM HEAVY DUTY SCALE

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INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

Britain

BRITAIN has just held an exhibition devoted to electronic equipment, the manufacture of which is now an important section of the much larger radio industry. Some £4 million of electronic devices were exported in 1949. Electronics are of growing importance to molders who use about 800 tons of phenolic powder in molding these various pieces of specialized equipment. This is about one-tenth the quantity taken up by the radio industry. Today the British radio industry is busier than it has been for three years, and the molding section is taking as much powder, mostly thermosetting, as the plastics industry can supply.

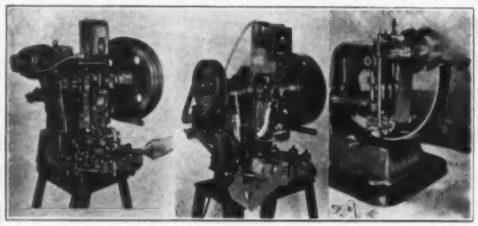
Radio knobs.—A combination of styrene and phenolic for radio knobs is now being used for 1951 radio sets. E. K. Cole Ltd., Southend, is producing these attractive knobs by injection molding a styrene disk over a molded core of black phenolic.

Fish boxes.—Controls off fish mean that there is now a greater margin of price for packaging. Hitherto merchants and fish curers have had to be satisfied with ordinary softwood boxes, mostly non-returnable. The introduction of an improved box made by spraying ordinary boxes with a special air-drying urea-type resin is being watched with a good deal of interest by the trade. It is claimed that the new type of fish box, which is somewhat more expensive than the old one, is more durable, holds ice longer, never becomes completely sodden with water, and is more hygienic.

Vinyl slide rule.—Heavily pigmented white rigid p.v.c. is now being used for making mathematical and drawing instruments instead of hardwood. Slide rules and ordinary rulers in p.v.c. are selling at about 15% less than corresponding instruments in wood. Dimensional stability of these instruments is claimed to be satisfactory.

Informative labelling.—Competitive trading is forcing manufacturers of plastics articles to follow the American example of giving advice to purchasers of plastics goods so as to ensure that they are not subjected to improper use. Already, firms merchandising molded urea tableware and trays advise buyers not to wash these articles in hot soda water and not to place them in a

*Reg. U. S. Pat. Office.



A FULL LINE *of—*

1. Hot Stamping Equipment
2. Gold Embossing Machines
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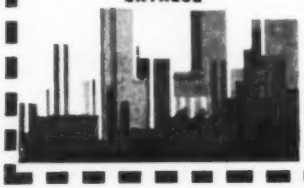
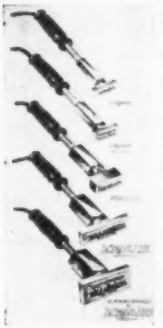
4. Special Machines for any plastic marking job.

ASK FOR PLASTIC MARKING CATALOG





ACROMARK Company

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Use ELASTOMER 70, a cold-poured, cold-setting synthetic rubber to make flexible molds & models of any thickness accurately and quickly!

Other Products: ELASTOMER 185, a tough vinyl plastisol curing @ 185°F., also can be used as a flexible mold, model, filler, or coating (slush molding on a 5 min. cycle)! METALSTONE, a glassy metallic cement can be used for heat forming thermoplastic sheeting!

Small trial lots	ELASTOMER 70	$13.80/12#
	ELASTOMER 185	9.80/10#
	METALSTONE	5.80/15#

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Flexible Mold Maker's Handbook: $1.00

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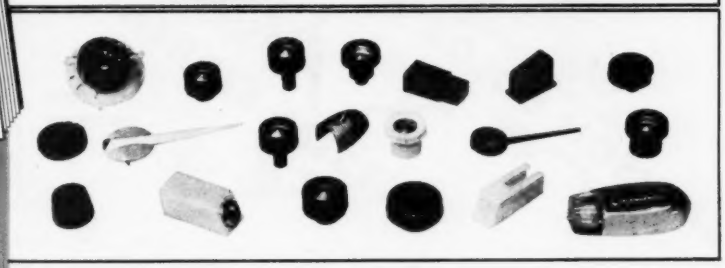

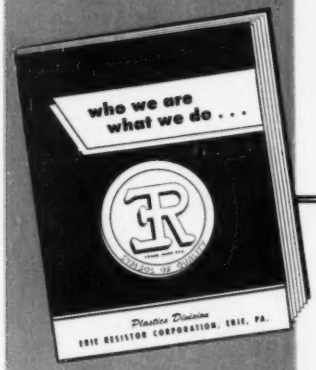

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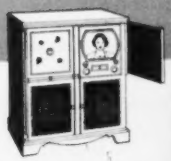
One of a series of advertisements showing Erie Resistor Custom Molded Plastics used in various industries.

Radio and television manufacturers depend on Erie Resistor for scores of parts in custom molded plastics . . . from such basic units as one piece windows and frames to cabinets, dials, gauges, and control knobs. They have learned that Erie combines the beauty of quality molding with the economy of production know-how.



Plastics Division

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LONDON, ENGLAND · · · · TORONTO, CANADA

hot oven. Fabricators of p.v.c. rainwear, babies' pants, etc., affix tags to the garments giving simple advice as to care of the plastic. Customer instruction is being advocated by the British Plastics Federation as a method of popularizing plastics.

Plastics in buses.—The British motor trade is now using more plastics in commercial vehicles, especially large buses. One of these, which attracted a good deal of attention at the recent British Motor Show in New York, was equipped with roof panels made of acrylic sheet so that passengers can enjoy an uninterrupted view of mountain scenery and high buildings. Duple Bodies Ltd., London, built this bus.

—*Howard Williams.*

British Industries Fair

Five new factories are being built in Britain for producing chemicals from petroleum by the cracking process. These chemicals were all previously purchased in the United States. For example, benzene, toluene, and xylene made not from traditional coal tar but from petroleum were exhibited for the first time at the British Industries Fair in May 1950. One of the factories is also producing ethylene for polyethylene by the petroleum cracking process and ethylene glycol for the synthetic fiber Terylene.

Another exhibit of interest to the plastics industry at the fair was the phenolic base plate for a heavy refrigerator motor. The plate weighs 31 lbs. and measures 31 by 20 inches. Also on exhibit were sand cores bonded with synthetic resins, and an automobile body bonded almost entirely with synthetic adhesives, thus eliminating the use of practically all screws.

Nylon film was also shown for the first time at this fair. An interesting exhibit was a polyethylene bag for frozen foods. Such bags are now being carried on a whaling ship to be returned with sealed packages of whale steak.

European Vinyl Plants

Announcement of a new plant near Split, Yugoslavia, for the production of 12 million lbs. of vinyl resin a year calls attention to the increasing importance this material has assumed in Europe. In addition to the Yugoslav plant, there are now vinyl plants in Belgium, France (two), Italy, Switzerland, Sweden (two), and Poland. Another plant is going up in Norway.

Capacity is comparatively small being estimated at a maximum of 3 million lbs. or less a year for each plant. However, in Germany there are several plants, two of which are said to be capable of producing over 120 million lbs. a year each, which is a combined capacity exceeding the amount of vinyl resin used in the United States in 1949.

One of these plants is in East Germany, and it has been reported that p.v.c. resin from this plant has been made available in Western European countries at prices ranging from 15 to 25 cents a pound. This is a rather curious situation since it had always been assumed that Russia would use every pound of vinyl made in countries under her control.

It is estimated that there are nearly 40 calenders in Europe working on plastics, divided as follows:

Pre-weighed . . . No measuring . . . No mess . . .

Each sealed, pre-weighed package of Jamison Color Mix contains sufficient material to color 100 pounds of crystal polystyrene. Your powder man just mixes the contents of the bag with crystal polystyrene for 10 to 20 minutes . . . . then you're ready to mold.

COLOR ENGINEERING

Jamison Color Mixes, tested in over *six years* of actual molding plant use, yield consistent results, because of the special way in which all ingredients are carefully pre-blended.

ALL COLORS

Color Mixes are available for preparing all standard transparent and translucent colors. Special colors can be supplied on quantity orders.

DOWN GO COSTS

The savings obtainable with Jamison Color Mixes favor their use over pre-colored materials. Labor costs are almost non-existent. Jamison Color Mixes can be mixed on most standard mixing equipment or on special units which we can recommend.

DETAILS & LITERATURE. . . .WRITE

Send today for the complete story on Jamison Color Mixes and the money they can save you. Please mention the type of mixing equipment you have, if any.

H. JAMISON PLASTICS

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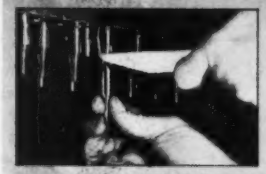
Change Punch Press Jobs



1. Remove unwanted punches

As Easy As This

2. Insert punches for next job

With R-B INTERCHANGEABLE PUNCHES and DIES

When you have similar parts to pierce, each requiring a few changes in hole size, shape or location, try using R-B Interchangeable punches and dies.

You can quickly remove unwanted punches and insert the ones you need. R-B retainers can hold large punches for one job, small punches for another; round punches for one, square for another; standard shapes for one, special shapes for another; or, can be left blank if no hole is wanted. Time to switch production: only a few minutes.

Remember: these are *extra* savings to the many other proven advantages of R-B interchangeability.

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Vinyl printing "ghosts" can gobble into profits by piling up yards of ruined film. But you can quickly put these "ghosts" on a starvation diet by switching to our super-fast drying inks that positively won't mark-off or migrate, no matter how fast you run your presses. And what's more, these inks need no interleafing.

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All Atlas ink products have proven their stability and printing quality under both favorable and adverse printing conditions.

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Now! non-curling inks for Blotch pattern.

ATLAS COATINGS CORP.

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Vinyl Stabilizer
#900 Combination
ADVANTAGES
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Ferro's new organic hydrochlorophil vinyl stabilizer #900 is establishing amazing records for unusually good heat stabilizing efficiency when used in recommended combinations. If heat is one of your big processing headaches, it will pay you to run a test batch with #900 and Ferro's Barium and Cadmium stabilizers in combination. We assure you, you will be pleasantly surprised with a new high in heat stabilizing activity.

To obtain a free sample quantity, simply complete the coupon below. We will be glad to mail you a test quantity along with a product and performance data sheet. Too, please remember much of Ferro's stabilizer research has been conducted jointly with some of the largest producers and users of vinyl resins. This experience and background can be helpful to you. Remember, Ferro offers vinyl manufacturers a *complete* line of stabilizers . . . each formulated with a technical excellence that can be depended on—each formulated to perform with uniform, dependable results, from order to order—batch to batch.

SEND US SAMPLES, PRICES & ADDITIONAL INFORMATION ON THE ITEMS CHECKED

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A COMPLETE LINE OF . . . VINYL STABILIZERS • METALLIC SOAPS • DISPERSING AGENTS • SURFACE ACTIVE AGENTS • DRIERS • COBALT COMPOUNDS

Spain (1); France (4); Switzerland (2); Italy (3); Poland (2); West Germany (10); Belgium (3); Holland (2); Denmark (1); Sweden (1); England (5). About 60% of them have been built especially for vinyl calendering, and most of them are either American Farrel-Birminghams or Adamsons or Belgian Thiriau. A few are made by British, French, and German manufacturers. The other 40% are modified rubber calenders.

The number behind the Iron Curtain is, of course, obscure, but it is known that at least 12 were set up in Russia in 1939. At least six calenders are thought to be in Czechoslovakia, with at least half of them working on vinyl, and there is known to be at least one calender in Yugoslavia.

South Africa

Tell Mfg. Co., Orange, N. J., has recently opened associated manufacturing companies in England and South Africa for plastic extrusion, bead manufacture, and pearlizing. Usher & Tell, Ltd., the English affiliate, is located in Darlington, and the South African subsidiary, Telus Pty. Ltd., has recently completed a new factory at Edenvale, Johannesburg.

India

According to The All India Plastics Manufacturers' Association, the plastics industry in that country has about 126 presses for compression molding, 145 injection molding machines and 13 extrusion machines. The annual consuming capacity for the industry is estimated at 2500 tons of thermosetting molding powder, 3600 tons of thermoplastics molding powder and about 250 tons of plastics raw materials such as sheets, tubes and rods used for fabrication purposes.

Laminate plant.—From H. N. Patel, Commercial Manager of Bakelite (India) Ltd., comes word that a plant for the manufacture of phenolic laminated sheet is being erected by Hyderabad Laminated Products Ltd., and is expected to be in production late this year. Its output of general purpose electrical grades of laminated sheet is expected to be sufficient for India's requirements at the present time.

From the Industrial Plastics' Notebook...

Pin Point Gating for Better Mottled Effects

Problem was to keep costs down, yet to produce a quality product. Good mottled effect was a "must." Chose pin point gating for quick, even-density filling of cavity, minimum weld lines, lack of gate scars. Name hot stamped after molding to reduce costs even further. Complete success—Customer fully satisfied—

Portable radio cabinet molded for Noblitt-Sparks Industries, Inc. Columbus, Indiana

Take a note from the many customers who, by repeating orders from year to year, have indicated their complete satisfaction with molding done for them by Industrial Plastics. Ask us to explain what our thorough engineering and design means in terms of your product's cost and performance. Ask us to prove what we can do for you. Write today. No obligation.

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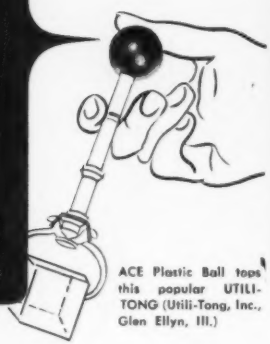
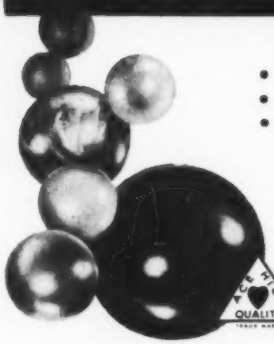
ACE PLASTIC BALLS
add quality and utility
to hundreds of products
Completely Seamless – Precision Fabricated to order.



ACE Plastic Ball tops this popular UTILI-TONG (Utili-Tong, Inc., Glen Ellyn, Ill.)



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- VARIETY OF PLASTIC MATERIALS
- WIDE VARIETY OF COLORS

Complete facilities for fabricating plastic parts for all industries. Estimates submitted promptly upon receipt of your blueprints or specifications.

Write today for Color Bulletins and Samples.

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NEW EASY TO USE LABELS

Contact Labels

STICK INSTANTLY . . . WITHOUT MOISTENING

Archer Contact Labels are pressure-sensitive . . . easily applied *without moistening* by finger-tip pressure. They stick and stay stuck to Styrene and other plastics, metal, glass, paper or any clean-smooth surface. Contact Labels are individually die cut and mounted on backing tape in rolls . . . for quick-easy handling. Over 58 stock sizes are available in lengths from ⅜ inch to 2½ inches—or they can be made to suit your needs, plain or printed in any color combination. Contact Labels are perfect for informative labeling, product identification, price markings, instructions . . . and every label use where time, appearance and economy are important.

New Archer Dispenser Offers Production Line Speed

Your name on a company letterhead will bring samples and literature.

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Styrene knob, molded as part of dome, is center-gated on outside

Cake Refresher

WHEN Amos Molded Plastics, Edinburg, Ind., decided to produce a new plastic "cake refresher," it established the following design objectives: maximum utility; outstanding beauty; sound construction; inclusion of features which can be secured economically only by molding; entire elimination of surface blemishes; and reasonably low price for the quality of merchandise produced.

With this program as a guide, the firm developed a styrene tray and dome designed to serve many purposes in addition to the original use for which it was created. The finished product incorporates the fine craftmanship found in hand-wrought footed metal trays; this followed the conviction that the molding process is especially adapted to the production of equally fine workmanship with intricate engraving that will capture the shopping eye of female consumers.

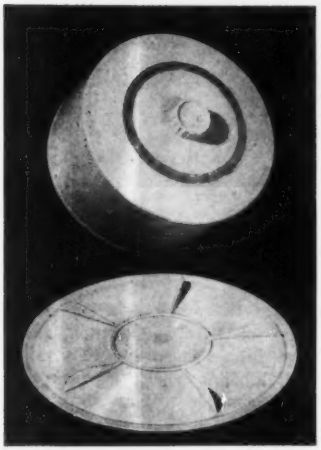
Made of Styron, the dome and tray weigh 1 lb. 3 oz.; styrene was chosen because of its physical properties and economy of cost in view of the large amount of material required per unit. In addition, this plastic does not impart odor or taste to foods and is not affected to any extent by exposure to moisture.

Two characteristics desired in the new refresher were strength and rigidity; these were achieved by increasing the wall section and by including reinforcement on the under-

side. The latter was obtained by developing the five feet on the tray into lateral ribs on the underside so that the base is footed and reinforced at the same time.

Research having disclosed that stores experience difficulty with cemented knobs on covers, it was decided to mold the dome and knob in one piece.

The border of the tray was designed to give artistic shadow distribution when molded in colored



Feet on underside of tray are made as lateral ribs for reinforcement

material. Since the tray is also run in a clear material, the ribs had to be part of the overall design, and the border had to be developed in such a manner that it would tie in with the five ribs. In addition, it was necessary to produce a border design which would permit covering up knockout pin marks. A rose with a round center to hide the knockout marks was created in the border; leaves were spaced so that ribs join the border at every sixth flower.

To hide the center sprue mark, a three-dimensional rose was designed with petals partly sandblasted in the mold. The sprue was then machined with a frosted finish at the center of the rose which was hand engraved at the end of a larger-than-normal sprue bushing. A similar technique was used to hide the gate mark on the dome piece, which is center-gated on the outside of the knob.

Plan Production for
PROFIT in '51

if you aren't up to your ears right now in custom molding plans for '51—you had better get going if you hope to stay ahead in what promises to be a good, but highly competitive year.

HERE AT PEERLESS WE ARE NOW DEEP IN PLANS FOR '51. NEW EQUIPMENT IS BEING ADDED... EXISTING FACILITIES IMPROVED... AND OUR ORGANIZATION SHARPENED.

Whether you are planning new plastic products, or want improved production on your present ones—consult with Peerless* on how to achieve your goals.

PEERLESS ENGINEERING INGENUITY WILL GIVE YOU PRODUCT PERFECTION... STRIKING COLORS... AND RELIABLE DELIVERY—ALL AT A PRICE THAT SPELLS PROFIT.

MOLDING CAPACITY

Compression and Transfer: TO 500 TONS
Injection: TO 70 OUNCES AND 700 SQUARE INCHES

PLANT FACILITIES INCLUDE:

Complete mold making and tooling...contamination-free raw material storage

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There's no mistaking the superior quality of the marking done on thermosetting and thermoplastic items when you've used All Purpose hot stamping foils—impressions are cleaner and sharper, rejects are fewer, stamping cycles are faster.

All Purpose foils give top performance in every type of hot stamping press. They are unexcelled for flexibility and uniformity.

- **pigment roll leaf**
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See the difference yourself, submit sample articles to be stamped with All Purpose foils. Or write for prices and foil samples.

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6 DEGATOR

STANDARD TOOL CO.
83 WATER STREET, LEOMINSTER, MASS.
Outfitters to Plastics Mfrs. Since 1911
OMNI PRODUCTS CORP., Export Distributors, New York, N.Y.

Optical Acrylic

Neon display has four acrylic panels with red acrylic letters on them

NEW avenues to greater expression in electrical advertising signs have been opened by the use of optical acrylic sheet. Because this plastic sheet is heat-resistant, warp proof, and impervious to paint-damaging ultra-violet rays, three obstacles to extensive use of plastics for this type of sign work have been removed.

A striking example of this application is a large neon display prepared by Stalcup Neon Electrical Advertising, Inc., Kansas City, Mo., for a local restaurant. The sign consists of four vertically arranged panels fabricated of ¼-in. Plexiglas II U.V.A. flat-shrunk-sheet by Quality Plastics Corp., also of Kansas City. Each panel's illustration, conveying a graphic picture of the product, is hand-painted on the inside surface of the sheet in black and then sprayed with a coating of white paint.

The panels carry feature copy in three-dimensional red acrylic letters which are bonded to the faces. The name at the top of the display is composed of fabricated channel letters.

Brilliant indirect lighting is used to create the impression of a halo around each acrylic panel and make the sign outstanding either by day or night. Further attraction is pro-

in Neon Signs

Picture on acrylic sign is painted in black, then sprayed with white

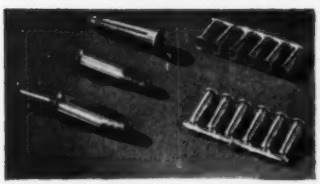
vided by rows of waterfalling lamps on the outside and bottom of the display.

The complete sign is 22 ft. high and extends 7 ft. horizontally. The panels are 31 in. square. All fillers and frames are polished copper.

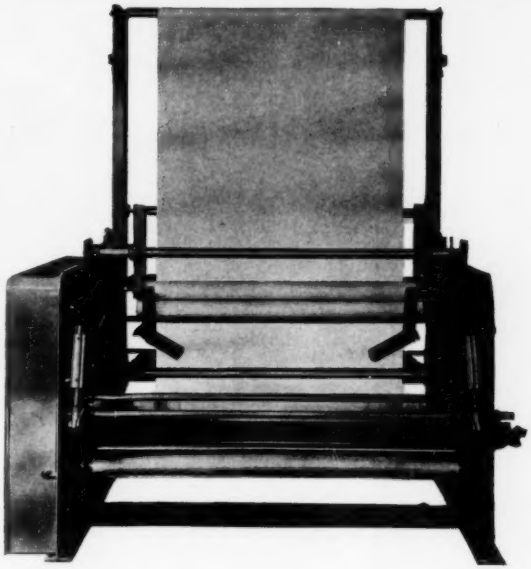
Screw Anchors

DESIGNED to hold screws securely in almost any type wall material, acetate expansion screw anchors are being produced by Nalle Plastics, Inc., Austin, Tex. The plastic device, injection molded of metallic material, is distributed by Anchoring Industries, Detroit, Mich. Made in a range of sizes, the anchors are flexible, permitting expansion, and strong so that the screw is held in place firmly. When used, holes are first drilled into the wall, after which the expansion anchor is driven in, and the screw is then inserted in the hole where it is solidly anchored.

Flexible injection-molded expansion anchors hold screws in place



FULLY AUTOMATIC BATCHING OF YOUR PLASTIC FILM



Just load the magazine of the Progressive Automatic Batcher with cardboard tubes and set the desired number of yards per tube on the controls. Then, without requiring additional attention, other than the replenishment of the tube supply, the Automatic Batcher will wind the proper yardage, cut off the film and start winding on a new tube!

An anti-wrinkle slat expander smooths the film and removes all wrinkles before the film is wound on the rolls.

Users have found that the installation of a Progressive Automatic Batcher increases their film handling efficiency and brings costs down amazingly. This remarkable unit, indispensible in any plant fabricating plastic film, is most logically placed at the delivery end of a printing press, a calender, an embosser or some other processing machine.

Send for details

Progressive machine co., inc.

Specialists in Plastic Film Handling Equipment

198-202 East 25th Street Paterson 4, N. J.

Tubing Machines • Continuous Hemmers & Sealers • Film Cut-Off Reels

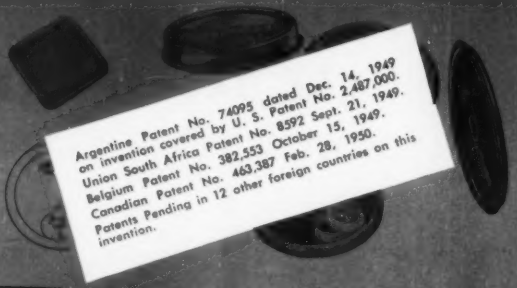
Tupper Seal, air and liquid tight flexible covers [illegible] and are included in the sets of all Tupperware Canisters.

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans, Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.



Argentine Patent No. 74095 dated Dec. 14, 1949 on invention covered by U. S. Patent No. 2,487,000. Union South Africa Patent No. 8592 Sept. 21, 1949. Belgium Patent No. 482,553 October 15, 1949. Canadian Patent No. 463,387 Feb. 28, 1950. Patents Pending in 12 other foreign countries on this invention.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER!

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

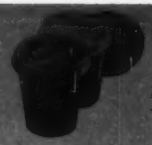
The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

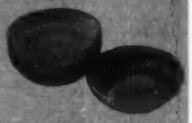
TUPPER CORPORATION



There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Pour Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.

The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight flexible covers. Keeps contents fresh as no other such container.



When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a boon when funnels are used as storage containers.

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas New York Show Rooms 225 Fifth Ave.

ADDRESS ALL COMMUNICATIONS TO: Department D

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PHOTOS COURTESY BAKELITE DIV.

Vinyl tape holds matching cuts in seedling and budwood stock in place

Grafting Tape

USE of a new Vinylite plastic tape for tip grafting of plant seedlings is claimed to be quicker and less costly than when conventional nursery techniques are employed. Developed by Resin Industries, Santa Barbara, Calif., the new-type graft union is made by cutting the seedling off on a slant cut about ¾ in. long, and located 2 to 3 in. above the soil. This cut is matched with a similar incision on the same-sized stock to be used in the grafting. These two similar cuts are then held in alignment by the vinyl tape. The budwood stock is cut off above the selected bud, and this incision is also sealed.

Incision is sealed with vinyl tape after cutting stock above the bud

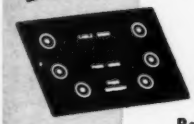
Engraving

PROFILING
VERTICAL
MILLING

Displays

Dies

Signs



Panels

Name Plates

Here is the most versatile machine for any plant. . . . So simple to operate by unskilled labor.

NEW HERMES
Engravograph
TRADE MARK

This heavy duty bench type model covers a larger engraving area than any other machine of its kind.

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World's Largest Manufacturer of Portable Engraving Machines

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If your company puts its product in packages

Try this Quick Quiz . . .

? **Do you know all the ways that modern methods can cut the costs of your packaging operations?**

? **Are you familiar with the latest tricks for boosting sales by improving package appearance?**

? **Are you sure you're using the best kind of package to protect your product from damage?**

If you've had to answer "No" to any one of these questions, it's likely that you're unnecessarily losing money every business day.

Fortunately there's an easy way out: MODERN PACKAGING Magazine is the world's most authoritative publication devoted exclusively to packaging problems and their solutions. It reports all of the newest developments in packaging — materials, machinery, design and production. It reports each of the newest ways to merchandise packaged products of all types, from frozen foods to monkey wrenches.

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MODERN PACKAGING
MAGAZINE
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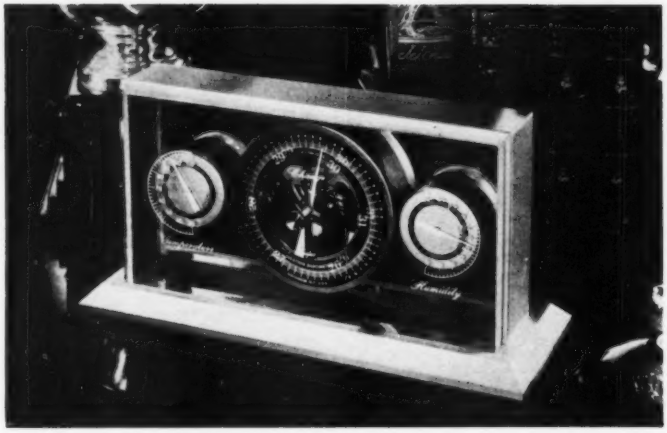

Case consisting of two crystal-clear acrylic panels mounted in a gold-finished frame encloses barometer, thermometer, relative humidity indicator

Weather Instruments in Plastic

BY setting weather instruments in panels and solid blocks of acrylic, three desirable advantages in encasing such precision devices have been gained. Because of their delicate nature, such devices must be protected by a substantial material; their dials must be clearly visible; and the instruments should be decorative in appearance.

Sturdy, clear, transparent acrylic is being used for enclosing a pair of new weather instruments recently introduced to the market by Taylor Instrument Cos., Rochester 1, N. Y. These two new models consist of the Edgemont Combination Barometer (a grouping of three instruments—barometer, temperature indicator, and relative humidity indicator), and the Solitaire Stormoguide, consisting of a single barometer. The three-instrument unit was styled by Walter Dorwin Teague.

The case for the Edgemont model consists of two crystal-clear acrylic panels mounted in a gold-finished metal frame. The material is Plexiglas acrylic fabricated for Taylor by Steiner Plastics Mfg. Co., Long Island City, N. Y. The panels measure 10 by 5 by $\frac{5}{8}$ in.; the gold-tone dials on the front panel have white numerals and graduations. These numerals and graduations are applied to the inner surface by the silk screen process using a special ink prepared for use on Plexiglas. The open-face barometer is adjustable for elevations from 0 to 3500 feet.

A sparkling-clear Plexiglas block, measuring $5\frac{1}{2}$ by $5\frac{1}{2}$ by $1\frac{3}{4}$ in., is used for mounting the Solitaire barometer. This unit has a gold-finished metal base with bezel to match. The Stormoguide features a signal device which automatically indicates whether the barometer is rising or falling. Both models are particularly suitable as gift presentations and are striking decorative additions to home or office.

Barometer rests in hole drilled through a solid block of acrylic

• MANUFACTURERS' LITERATURE •

To obtain any of the booklets or catalogs listed below, simply circle the corresponding number on the post card, fill in the information requested, and mail.

THERMOSETTING PLASTICS
Given is information on the uses, advantages, properties, grades, etc. of Dilecto and Celoron laminated and molded thermosetting plastics. Illustrations and tabulations are included. 30 pages. Continental Fibre Co. (6-600)

PEARL ESSENCE SUBSTITUTE
Nacromer, a material used extensively as an undercoat in the manufacture of simulated pearls, is discussed. Also presented are its many other uses and shipping data. The Mearl Corp. (6-601)

COLD DIP DYE
Technical data sheet containing information relative to the use of Rez-N-Dye cold dip dye to add sales appeal to metallized plastics. Methods of application are given and prices are quoted. Schwartz Chemical Co., Inc. (6-602)

CUT-OFF ATTACHMENT
Bulletin discussing automatic rotary-type Cut-Off Attachment. Illustrations show construction and uses of the equipment. Specifications included. Barker & Davis Machine Co., Inc. (6-603)

CYANAMID PLASTICS
Compilation of data on several new chemicals, some of which are: Aryl Biguanides, Guanylurea Salts, Beta Chloropropionitrile, Dialkyl Cyanamides, Glycolonitrile, Lactonitrile, Succinonitrile, and Potassium Cyanate. 120 pages. American Cyanamid Co. (6-604)

PLEXIGLAS FOR STORE IMPROVEMENT
A photographic record showing Plexiglas put to actual use in the modernization and improvement of several stores, both inside and out. Accompanying paragraphs explain the many advantages of this product. 12 pages. Rohm & Haas Co. (6-605)

TRACER CONTROLLED MILLING
Illustrated and described throughout this 16-page brochure is the Keller BG equipment for tracer-controlled milling. Operational principles, specifications, and features are included. 14 pages. Pratt & Whitney Div. of Niles-Bement-Pond Co. (6-606)

ELECTRIC POWER DRIVES
The Sterling Speed-Trol, a modern variable speed electric power drive, is discussed along with its various features and advantages. Illustrated 4-page folder. Sterling Electric Motors. (6-607)

SUCROSE OCTA ACETATE
Given are the physical properties, chemical properties, and applications of Sucrose Octa Acetate, a cane-sugar derivative which can be used to modify synthetic resins and plastics to achieve special effects for specialized uses. Niacet Chemicals Div., U. S. Vanadium Corp. (6-608)

IMPROVED PACKAGING
Folder demonstrating advantages of various Monsanto plastics for packaging and the favorable merchandising aspects of visual packaging. 4 pages. Monsanto Chemical Co. (6-609)

"PERSPEX" ACRYLIC MATERIALS
Book dealing with the history, character, forms available, working, shaping, shock molding, cementing, dyeing, finishing, properties, etc. of Perspex Acrylic materials. 72 pages. Imperial Chemical Industries. (6-610)

MOLD TEMPERATURE CONTROL
The advantages of the Thermolator Control, which is an automatic device for control of both halves of a mold, are given, together with suggestions and methods for its uses. 8 pages. Industrial Mfg. Corp. (6-611)

PRECISION CASTING
Folder containing the advantages, specifications, and pattern information in using the Crain-Ambrose process of precision casting. Crain-Ambrose Co., Ltd. (6-612)

PLASTIC WARE
Provided are specifications, illustrations, and purchasing information on various Aeroware products such as salad sets, serving trays, candle holders, etc. 4 pages. Standard Products Co. (6-613)

OIL HYDRAULIC PUMPS AND CONTROLS
Detailed information on pumps, controls, assemblies, motors, transmissons, and cylinders relative to oil hydraulic pumps and controls. 48 illustrated pages. Vickers, Inc. Div. of Sperry Corp. (6-614)

LUMITE
The woven saran fabric Lumite, reported to combine durability, comfort, and lasting beauty, is described. Illustrations are included showing the material in various uses. 8 pages. Chicopee Mfg. Corp. of Georgia. (6-615)

DIMENSIONAL ENGRAVER
The construction, specifications, and features of the 2- and 3-Dimensional Engraver, together with its various attachments and accessories, are described. Chart illustrating Mico Master Type is included. 8 pages. Mico Instrument Co. (6-616)

JOINTS FOR SYSTEM HANDLING
Illustrated brochure giving the uses, construction, etc. of Diamond ball, swing, and revolving joints used wherever a flexible connection is needed. 12 pages. Diamond Metal Products Co. (6-617)

PONY MIXERS
Mixers designed for experimental purposes and for manufacturers desiring to mix small quantities of paint bases, inks, dyes, and other paste materials are described. Charts and illustrations included. 4 pages. The J. H. Day Co. (6-618)

ELECTRODE STEAM BOILER
Description, method of steam generation, pressure regulation, and automatic balanced control of electrical input for the Speedy-lectric steam generators and steam-jet cleaners are included. Operating details are also given. Livingstone Engineering Co. (6-619)

DU PONT PLASTICS
Working techniques, properties, and uses of Polythene, Nylon, Rulan, and Lucite are discussed. An explanatory chart together with illustrations exemplifying the features of each product are also included. E. I. du Pont de Nemours & Co., Inc. (6-620)

CLORAFIN
Technical booklet discussing Hercules chlorinated paraffin, Clorafin, including data on use in vinyl plastics. Hercules Powder Co. (6-621)

WELDING, BRAZING, AND SOFT SOLDERING
Detailed instructions on welding, brazing, and soft soldering of Monel, Nickel, and Inconel. International Nickel Co. (6-622)

PHENOLIC RESINS
General data on phenolic resins as used in rubber compounding, brake linings, grinding wheels, bonding wood, insulation, sand cores, electrical parts, and in laminating and molding. 12 pages. Durez Plastics & Chemicals, Inc. (6-623)

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GRINDING PLASTICS SCRAP PROFITABLY
Bulletin in color illustrating and explaining construction features and operation of American KC Rotary Knife Chopper. Includes detailed specifications and an outline of possible applications. American Pulverizer Co. (6-624)

DRY COLOR PIGMENTS FOR PLASTICS AND RUBBER
A list of the Drakenfeld inorganic pigments available including their specific gravities and compositions. B. F. Drakenfeld & Co., Inc. (6-625)

PLASTICS DOLLAR'S WORTH
Illustrated bulletin describing eleven G-E advantages that may help save money on plastics jobs. 12 pages. General Electric Co. (6-626)

LUMINESCENT APPLICATIONS
Descriptions and illustrations in the use of luminescent pigment applications in safety aids, toys, advertising, interior decoration, radio and television, and aviation. The New Jersey Zinc Sales Co. (6-627)

PRESSES
Catalog describing semi-automatic compression and plunger-molding presses. Also included are specifications and a brief description of automatic molding presses and preforming presses. F. J. Stokes Machine Co. (6-628)

THREAD CADDY
Bulletin discusses the various uses of this new miniature sewing kit made of heavy ivory plastic. Illustrated. The Emeloid Co., Inc. (6-629)

HYDRAULIC PRESSES
Information on the Adamson line of Hydraulic presses, including rod type, sideplate type, single and multiple openings for mechanical goods, V-belts, conveyor belting, and transmission belting. Adamson United Co. (6-630)

PLASTICIZER
Summarization of the chemical and physical properties of KP-140 plasticizer and its testing in vinyl plastics. Specifications, properties, and uses are discussed. 4 pages. Ohio-Apex, Inc. (6-631)

PLASTICS TESTS
Price list of tests frequently performed on plastics film, sheeting, and coated fabrics. 4 pages. U. S. Testing Co., Inc. (6-632)

FURFURAL
Report on the current industrial uses of Furfural, an aldehyde. Its chemical applications as a selective solvent, a dispersant, a resin-former, and a chemical intermediate are summarized. Illustrated. 20 pages. The Quaker Oats Co. (6-633)

PLASTIC SILL TRACKS
Discussed are the applications of Kys-Ite —a preformed plastic combining long-fibered wood pulp and synthetic resin— in molding window sill tracks. The material is reported not to warp, shrink, or swell. Keyes Fibre Co. (6-634)

PLASTIC FOOD-SAVER BOWLS
Considered are the features and construction of Gitsware food-saver bowls made of polyethylene molded material. Gits Molding Corp. (6-635)

EXTRUDING FACILITIES
Detailed information is given on the facilities available for deep drawng, forming, embossing, die-cutting, point-of-sale displays, silk screening, and printing by General Plastics Corp. (6-636)

LABORATORY MILL
Describes laboratory mill incorporating roller bearings and metallic piston ring-type oil seals on steel rolls for precision high temperature milling (to 650° F.). Wm. R. Thropp & Sons Co., Inc. (6-637)

POLYETHYLENE FILM
Given is data on Ger-Pak polyethylene film which is reported to be flexible at low temperatures, have low moisture-vapor transmission, be heat sealable, non-toxic, tasteless and odorless, etc. 4 pages. Gering Products, Inc. (6-638)

CONTROLS
A general review of electronic radar and radio control knobs, with specifications and descriptions for each. Dimensional chart and details on set screw are given. 6 pages. Harry Davies Molding Co. (6-639)

PLASKON PLASTICS
A compilation of various articles relative to the plastics field. Plaskon Div. of Libbey-Owens-Ford Glass Co. (6-640)

RESIN EMULSIONS
Technical data sheets discussing the general properties, specifications, plastization, thickening agents, compatibilities, etc. of Polycos 376 and 380 polystyrene-copolymer resin emulsions. American Polymer Corp. (6-641)

DIE PRESS
The construction of the Hobbs Tri-Power die press is explained. Specifications together with the machine's uses for paper, textile, rubber, and plastics are given. Illustrated. Hobbs Mfg. Co. (6-642)

MELTER
Brochure describing the Magnaflow Melter, a continuous-flow melting machine for elastomeric and other compounds. Included are features, specifications, and price list. Calresin Corp. (6-643)

PYROMETER CONTROLLER
Suggested applications, measuring and indicating features, control functions, scale ranges, and technical data are covered in this two-color release on the new Multi-Switch Capacitrol, an indicating pyrometer controller. Wheelco Instruments Co. (6-644)

GRANULATING MACHINES
Facts regarding the Cumberland plastics granulating machines designed expressly for plastics. Capacity, uses, advantages, etc., are included. Illustrated. Cumberland Engineering Co., Inc. (6-645)

TIME CYCLE CONTROLLER
Leaflet giving detailed information on Flex-O-Timer Time Cycle Controllers. Included are illustrations of working parts, application drawings, and a description of the synchronized operation that this equipment permits. Taylor Instrument Companies. (6-646)

STAMPING MACHINE
Included are the specifications, advantages, and a description of the Universal Stampomatic, a power-driven stamping machine, in this bulletin. Illustration shows the construction. Hambro Machinery Div. (6-647)

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PHOTOS COURTESY UNITED STATES RUBBER CO.

Drive gear of new thermoset shows no wear after long, heavy-duty use

Tough Thermoset

PRODUCTION in commercial quantities of a tough new plastic which promises to be of considerable interest to compression molders has been announced by the United States Rubber Co., New York, N. Y. First mention of this material appeared in MODERN PLASTICS, November, 1949, page 168.

The new plastic, marketed under the trade name Enrup by the company's Mechanical Goods Div., is a thermoset material for compression or transfer molding, yet is capable of being made in varying degrees of flexibility from elastic to hard.

The company has not revealed the material nature of this plastic, but its properties indicate that it is of the synthetic rubber-phenolic group.

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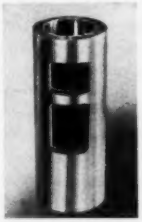

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COURTESY TELEX, INC.

Acrylic dome on recharger makes contacts visible. Base is of urea

Batteries

(*Continued from pp.* 59-64)

styrene. The material and the plug design offer three advantages: 1) the color gives eye-appeal to batteries which often have been referred to as "those same old black boxes;" 2) the design prevents spitting when the battery is on charge or under severe vibration conditions such as encountered in tractor and off-the-highway equipment; and 3) the plug is more economical than specially designed vent plugs made of hard rubber.

Red styrene vent plugs are also used on the Exide Air Transport battery. The vent plug was designed for use with a manifold attached to the battery to restrict the circulation of battery gases in an airplane and to take off any overflow of the electrolyte which may be highly corrosive to metals in a plane.

Another user of styrene vent plugs is C & D Batteries, Inc. The company's plugs are molded by Mack Molding Co., Inc., and are interchangeable on all two- and three-cell Plasticell batteries.

PROXIMITY FUSE

One of the most devilish weapons ever devised by man, and one to which plastics contributed many vital parts, was the proximity fuse[3]. Controlled by tiny radio tubes in the nose of the fuse, it is designed to explode when it passes within a certain distance of the target. The tiny battery enclosed in the nose of the fuse is highly detailed in construction. The battery plates were phenolic laminates, the top and bottom plates were phenolic, the whole battery was coated with vinyl or ethyl cellulose, and a plastic potting compound was used to help hold the parts together. The nose of the fuse had to be made of plastics since electrical waves must pass through without interference. After much experimentation with various plastics, ethyl cellulose was finally chosen, because even though a thermoplastic, it had enough heat resistance to withstand firing from a cannon, could be molded to close tolerances, and had the necessary toughness for the job. Although today's fuse probably bears slight resemblance to its aforementioned early model, it is a safe bet that plastics are a necessary and well functioning part.

[3] "Proximity Fuse Taught New Techniques," MODERN PLASTICS 23, 133, (Nov. 1945)

ACCESSORIES

Two 4-oz. plastic bottles filled with an electrolyte solution, one for each cell in the battery, accompany each shipment of the Wheat Rechargeable Spotlight and battery, a product of Koehler Mfg. Co., Marlboro, Mass. The bottles, molded of polyethylene by Plax Corp., Hartford, Conn., have made it possible for Koehler to ship the spotlight in a non-activated state. This method gives the purchaser the advantage of a battery that is fresh and not adversely affected by time lost in shipment or storage. The mouth of the plastic bottle fits securely into the filler plug holes and the flexibility of the polyethylene material allows the bottle to act as a syringe for the initial and subsequent fillings. Inert to the electrolyte solution and unbreakable, the bottles provide safe, convenient, and practical packages for transporting and storing a corrosive liquid.

Styrene-encased battery (left) uses phenolic-housed miniature charger

COURTESY MINIATURE BATTERIES

COURTESY PLAX CORP.

Polyethylene bottles for electrolyte solution are unbreakable, inert

Miniature Batteries uses plastics in a charger for its hearing aid battery. The charger, which is molded of phenolic by Waterbury Companies, Inc., Waterbury, Conn., is set into operation by plugging it into a regular AC outlet. The battery can be plugged into the charger when the hearing aid wearer retires, and will be fully charged when the wearer awakens six or more hours later.

Two plastics are used to form the housing of another hearing aid battery recharger. Produced by Telex, Inc., Minneapolis, Minn., the housing has a Plaskon urea base and a Lucite acrylic dome. With emphasis on economy, the recharger saves hearing aid users up to two-thirds in battery costs. Urea was chosen for the base of the housing because of its attractive finished appearance. Acrylic is used for the dome so that the batteries are visible to check connections and contacts during the recharging operations.—END

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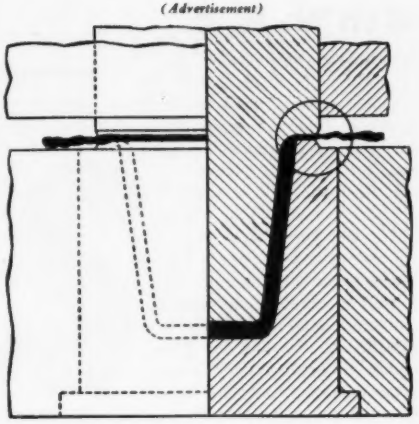

Molds for Plastics

It sounds foolish to say that molds are what you make them, but they are, and can be a definite headache for that reason. When a customer buys the cheapest mold that is offered to him, he may easily be heading for trouble. That same purchasing agent would throw up his hands in horror if some one proposed that he buy the cheapest available truck to tote his goods around. He knows well that there are other things to trucks than price. He would say that upkeep and continuity of service were important too, and that he was willing to pay for the insurance of these two items in the original cost.

Because the mold is in some one else's shop, and that some one else is assuming the responsibility for these items, is not enough to justify ignoring the quality of the mold to be purchased. Regardless of the blame being placed elsewhere for a breakdown in production, the purchasing agent will be the one to hear from the front office.

The most talented molder in the world cannot make a bad mold stand up to a heavy schedule. In fact, 90% of molding troubles, from accuracy to ultimate delivery, are traceable to inferior molds or mold designs. And most of them in turn trace back to pressure from some ambitious client who decided he would save money on the molds after the piece price had been settled. Add to that, of course, a weak, hungry molder, who yielded in the hope that this time he could get away without trouble. Sometimes he does.

George K. Scribner, President
Boonton Molding Co., Boonton, New Jersey
Phone: Boonton 8-2020

4th N. P. E.

(*Continued from pp. 74-76*)

The colors, patterns, and textures were much different from those used on the same company's fabrics designed for auto seat covers.

Vinyl floor tile with a simulated wood grain was shown by Surprenant Mfg. Co. The tiles, now available in walnut and primavera grains and soon to be available in other wood grains, simulate the appearance of a parquet floor when they are installed.

Another interesting piece with a wood grain finish was a long curved molding for use in the interior of a Willys station wagon. This piece, which was formed from Royalite sheet, was displayed by U. S. Rubber Co. and by the fabricator of the piece, Regal Plastic Co.

Among the new applications of phenolic shown was a molded housing for loudspeakers used in drive-in movie theaters. Fiberite Corp. showed the housing, which is molded of a rag-filled phenolic and is strong enough to stand such abuse as being dropped on the hard ground or being driven over by a car.

Machinery

As far as machinery and equipment were concerned, nothing revolutionary or basically new was shown. American Wheelabrator demonstrated the use of its equipment for removing flash from molded parts. That development was covered thoroughly in these pages last month.[2]

Probably the most interest was displayed in a machine for automatic spray-decorating of small parts. The machine, made by Conforming Matrix Corp., Toledo, Ohio, can spray-paint up to 3600 small pieces per hour. The painting is done from below while the parts are held against electro-formed masks which are flush with the table top. The machine is entirely air operated.

National Plastics Conference

The National Plastics Conference was held at the Stevens Hotel on March 29 and 30. The theme of the meetings was "A Decade of Opportunity With Plastics."

Wednesday morning session. Charles A. Breskin, publisher of MODERN PLASTICS and chairman of the Conference Committee, presided at the morning meeting on March 29. The keynote speech, "Selling—The Plastics Industry's Number One Job," was delivered by Alfred Schindler, president of Schindler Corp. The future markets for manufactured goods in general and for plastics in particular were outlined by Richard Neale, promotion manager of *Life* magazine, in a speech entitled "Where Will You Sell Tomorrow?"

The point of view of a retailer who sells plastics products was presented by Joel Goldblatt, president of Goldblatt Bros., Inc., who spoke on the subject of "Plastics—Promise and Compromise."

The sentiments of one large end user were presented by O. E. Norberg, manager of refrigeration and appliance engineering, Crosley Div., Avco Mfg. Corp. With a large refrigerator and its 24 lb. of plastics components for reference, Mr. Nor-

[2] See "Flash Removal by New Process," MODERN PLASTICS 27, 91 (May 1950).

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CARBIDE TIPPED
MEYCO SAWS

You will be interested in this radically new development IF your carbide tipped saws sound like a police siren; IF they develop a "snaky" cut after short usage; IF they dull fast because carbide tips become chipped.
MEYCO VIBRA-FREE* saws embody a new principle in saw design, a new control over vibration by the use of sound absorbing dampers, which eliminate excessive vibration, excessive noise . . . produce smoother cuts, longer blade life, longer life for carbide tips. You get MORE cuts between sharpenings and operators LIKE to use Vibra-Free* blades. Investigate this revolutionary development TODAY. Write for full information and price list:

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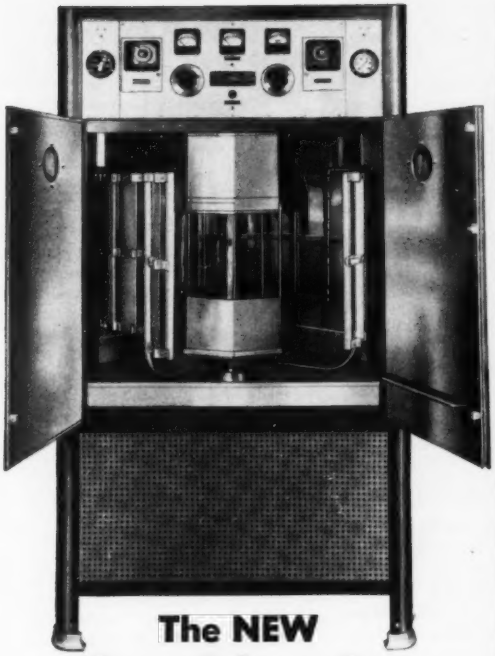

The NEW

Sunshine Arc Weather-Ometer

Type XW

A modernized and redesigned version of the open flame X-1 and X-1-A Weathering Units

Many of the control features that have proven their dependability in the Atlas Twin Arc Weather-Ometer have been combined with some features of the original X-1-A weathering unit to make a new Weather-Ometer of advanced design.

In the Type XW a new means of maintaining constant temperature is provided. Far more accurate temperature control is now available.

Radiation is from a Sunshine Carbon Arc which is of the motor-driven, open-flame type. Natural sunlight or intensified ultra-violet radiation is available depending upon the type of carbons and filters used. The light source has been improved to provide 16 hours of continuous operation as well as a number of other added conveniences.

All instruments are located on a convenient control panel, including an arc voltage setting switch and meter, cycle control of light and water spray, 1 to 24 hour shut-down time switch, thermo-regulator and running time meter.

Type XW is fully automatic and may safely be left in unattended operation overnight. If deionized water is to be used, aluminum spray piping can be furnished. The capacity of the stainless steel lined testing chamber is 54 panels. The machine is sturdily constructed and is shipped assembled, ready for connection.

ATLAS ELECTRIC DEVICES COMPANY

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berg reviewed "What Crosley Has Done With Plastics."

Banquet. Horace Gooch, Jr., treasurer of Worcester Moulded Plastics Co. and president of S.P.I., was toastmaster at the banquet on Wednesday evening, March 29. The main speaker of the evening was Tom Collins of the City National Bank & Trust Co., Kansas City, Mo. His topic was "This Promising World." A stage presentation, "The March of Plastics," was also presented at the banquet.

Thursday morning session. Gordon Brown, vice president in charge of sales of the Bakelite Div., presided at the conference session on March 30. Dr. Nelson A. Miller, chief, Marketing Div., Office of Domestic Commerce, reviewed the general problem of distribution in an address entitled "Does Distribution Cost Too Much?"

An industrial designer's viewpoint on plastics and their use in consumer products was presented by Harold Van Doren of Van Doren, Nowland & Schladermundt. The title of Mr. Van Doren's speech was "Sales By Design."

The last speaker at this session was Ben Gordon, editor of the Variety Store Editions of *Chain Store Age.* Mr. Gordon gave manufacturers of plastics products advice on how to do business with the large variety chains. He touched on the subjects of proper design, proper pricing, proper packaging, and distribution policies. His speech was entitled "Upgrading Plastics Volume Through Variety Chains."

International Luncheon. Tino Perutz, Omni Products Corp., served as chairman at the International Luncheon on Thursday, March 30. Mr. Perutz announced that plans had been completed for the formation of an international group of plastics industry members which would function as an organization to promote plastics trade all over the world.

Willard L. Thorp, Assistant Secretary of State in Charge of Economic Affairs, was to have spoken on "The Future of Our Foreign Trade." Mr. Thorp was detained in Washington and the paper he had prepared was read by Winthrop Brown, Director, Office of International Trade Policy, Dept. of State.

After Mr. Brown's talk, there was a panel discussion in which plastics representatives from 10 foreign countries answered questions concerning their countries' plastics industries.—END

More About Beads

In the article "Beads by the Billions" in the April issue of MODERN PLASTICS magazine a serious omission was inadvertently made. Engineering Laboratories, Inc., Pompton Lakes, N. J., declared to be the only manufacturer of centerless grinding machines for bead production, was not mentioned. It is reported that at least 90% of all beads made in the United States are made on Engineering Laboratories' machines.

In the same article, in the discussion of the development of pearlescent Lucite beads, no mention was made of A. C. Mason, head of Engineering Laboratories, Inc. Mr. Mason was a pioneer in that research.

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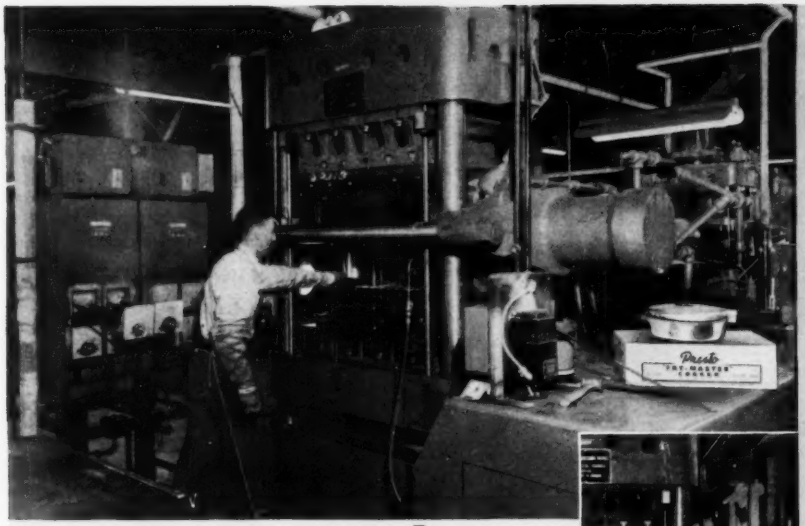

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Permeability

(*Continued from pp. 97-102*)

a given polymer film have been found to vary more widely than is probable from their size distribution, it is necessary to conclude that the solubility of the diffusing molecule in the polymer (Type III) is of major importance.

Effect of Side Chains

Bulky groups on the main chains of polymers may prevent the close approach of the main chains to form a compact structure. Also, they may frequently replace or mask the polar groups located on or in the main chain and thus decrease the bond forces between chains. The formation of holes, therefore, should be easier to accomplish in polymers containing bulky and non-polar side groups. (See Table IV.)

Table VI.—Size Effect on Diffusion of Vapor Molecules Through Films

Film No. and type	*Vapor*	*$P^a \times 10^{13}$, 35° C.*
I Polythene	Water	4.93[a]
	Methanol	3.31[a]
	Ethanol	2.57[a]
VI Polyacrylonitrile	Water	18.74
	Ethanol	0.10

[a] Average values taken from Table VIII.

The long butyral side chains of the vinyl-butyral/vinyl-alcohol copolymer appear to produce the greatest increase in permeability except in the case of water vapor. Here, the hydroxyl groups of polyvinyl alcohol which result in strong interchain bonding and which also

Table VII.—Effect of Structural Similarity on Permeability

	$P^a \times 10^{13}$
Similar pairs	
Polythene-hexane	130.0
Polyvinyl alcohol-water	575.0
Cellulose acetate-ethyl acetate	160.0
Polyacrylonitrile-water	18.7
Dissimilar pairs	
Polythene-ethanol	2.490
Polyvinyl alcohol-hexane	0.105
Cellulose acetate-carbon tetrachloride	0.167
Polyacrylonitrile-hexane	0.071

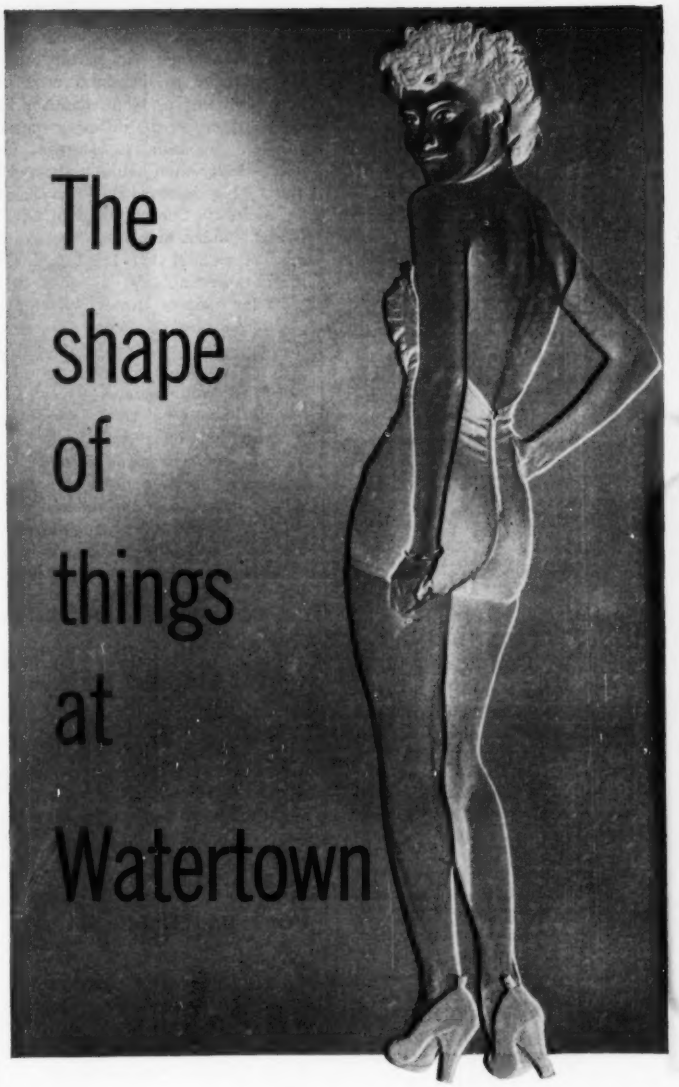
Table VIII.—Dipole Moments and Polythene Permeability at 35° C.

Vapor	*Dipole moment*	*Gage*	$P^* \times 10^{13}$
	Debye units[a, b]	*mils*	
Ethanol	1.7	1.0	2.50
		1.9	2.32
		3.0	2.62
		4.0	2.84
Methanol	1.68	1.0	3.15
		2.9	3.47
n-Propanol	1.66	1.05	4.10
n-Butanol	1.65	1.05	8.40
Acetone	2.71	1.0	4.18
		2.8	4.60
Water	1.85	1.1	4.98
		2.2	5.23
		4.1	4.57
Butyric acid	ca. 1.4	1.0	14.8
		2.8	13.6
Butyraldehyde	2.46	1.0	16.5
		2.85	14.6
Ethyl acetate	1.8	1.0	20.0
		2.2	22.9
		4.1	25.5
Acetic acid	1.7	1.0	21.1
(in ether)	1.23	2.15	25.3
(in benzene)	0.8	2.95	22.3
Butyl ether	ca. 0.7	0.8	44.7
		2.7	69.6
		4.2	99.2
Butylamine	1.3	1.1	58.7
		2.2	77.9
		4.1	89.3
Hexane	0	1.0	68.6
		2.15	109.0
		2.95	101.0
		4.1	130.0
Cyclohexane	0	1.0	78.0
Benzene	0	1.0	114.0
		2.05	144.0
		2.8	164.0
		4.25	236.0
CCl_4	0	4.1	170.0

[a] Smyth, C. P., "*Dielectric Constant and Molecular Structure*," Reinhold Publishing Corp.
[b] LeFevre, R. J. W., "Dipole Moments," 1938, Methuen and Co. Ltd.

have a strong attraction for water, have been replaced by the bulky, less hydrophilic, butyral groups. It is probable that water diffusion of Types I and II (due to holes) has been increased, but Type III diffusion of water vapor (due to solubility) must have been greatly decreased. The acetyl side chains of cellulose acetate and the phenyl side groups of polystyrene act to increase the permeability of cellulose and polythene, respectively, to benzene, carbon tetrachloride, and water.

The incorporation of a plasticizer into a polymer film may either in-



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crease or decrease the film's permeability. In line with the theory outlined, an increase in permeability may be due to increased ease of hole formation or to an increase in the solubility of the diffusing molecule in the film. A decrease in permeability then could be brought about by a decrease in either holes or solubility. Combinations of these effects (which are similar to those of side chains) are illustrated by the data of Table V.

P* for benzene through glycerol-plasticized films is slightly less than through the unplasticized films. This phenomenon appears to indicate that any increased diffusion brought about by chain spreading is more than offset by the lack of solubility of benzene in glycerol. In this case, glycerol appears effectively to plug some of the holes in the polymer. On the other hand, dimethoxyethyl phthalate, which is somewhat akin to benzene structurally, greatly increases the rate of diffusion of benzene through cellulose acetate.

The changes produced in benzene diffusion by glycerol and dimethoxyethyl phthalate are observed in reverse for ethanol diffusion. Glycerol-plasticized cellulose and polyvinyl alcohol are considerably more permeable to ethanol than are the unplasticized films, whereas dimethoxyethyl phthalate appears to decrease the ethanol permeability of cellulose acetate.

Effect of Size of Diffusing Molecules

It appears obvious that the size of a molecule is important in diffusion. Thus, a hydrogen molecule might diffuse even through the crystal lattice of a polymer, while a larger molecule, such as carbon tetrachloride, would have difficulty in squeezing through relatively large holes in the amorphous parts of the polymer. Another advantage of the small molecule is its ability to approach closely the bonding groups on the polymer chains. Permeability data showing the effect of size are listed in Table VI.

Although one might expect the permeability of polythene to water, methanol, and ethanol to increase in that order because of the increasing hydrocarbon content of the vapors, it is apparent that the increasing size of the molecules has

Table IX.—Temperature Dependence of Polythene Permeability

Vapor	*Temp.*	*Film gage*	P^* x 10^{11}
	°C.	*mils*	
Ethanol	35	1.0	2.50
	25	1.0	1.17
Acetic acid	35	1.0	21.1
	25	1.0	11.2
Water[a]	35	1.0	4.38
	25	1.0	2.90
	15	1.0	2.08
Ethyl acetate	35	1.0	20.0
	15	1.05	4.3
Benzene	35	4.25	236.0
	22	4.10	91.2
	10	4.10	49.7
Hexane	35	4.10	130.0
	22	4.10	63.5
	10	4.10	34.4
Carbon tetrachloride	35	4.10	170.0
	22	4.10	84.0
	10	4.10	41.3

[a] Unpublished data determined by Dr. P. M. Hauser in this laboratory at 80% relative humidity.

offset this effect and actually decreased permeability. The enhanced diffusion resulting from increasing hydrocarbon chain length in this series becomes noticeable in the alcohols of three or more carbon atoms. The striking difference in the permeability of polyacrylonitrile to water and ethanol is very good evidence of the ability of smaller molecules to approach closely to the interchain bonds and disrupt them.

Effect of Structural Similarity

Other factors being equal, it is the tendency of similar molecules to associate with one another or dissolve one another to a greater extent than structurally dissimilar molecules. This effect should be expected to reflect itself in permeation rates. A vapor molecule which is similar to the polymer molecule should be more readily adsorbed, and it should also weaken polymer interchain forces with a subsequent increase in the ease of hole formation. The similarity may be structural or it may be one of approximately equal dipoles on polymer and vapor. Thus, polythene with a dipole moment of approximately zero is is effect more similar to benzene and carbon tetrachloride than to propyl alcohol.

(*Continued on* p. 154)

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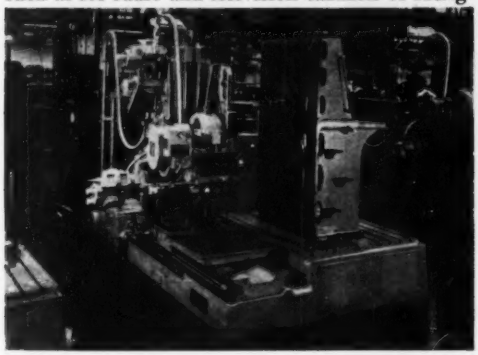

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It is also interesting to consider the possibility of a polar polymer inducing a dipole in the diffusing molecule. On this basis, it is possible to explain the anomalously high permeability to cellulose acetate and vinylidene-chloride/acrylonitrile polymers to benzene as compared to their low permeability to hexane and carbon tetrachloride. Benzene is known to have a high polarizability. Other pairs which are similar, at least with respect to dipole moments, are polyvinyl alcohol and water, and cellulose acetate and ethyl acetate. These considerations may best be illustrated by comparing the permeability constants of several similar and dissimilar pairs. (This information is presented in Table VII).

The relation of dipole moment to permeability is well illustrated by the data of Table VIII. The permeability of polythene (dipole about zero) to 16 different vapors of varying structure and dipole moment is listed. Remembering that P^* generally increases for polythene as the molecular size of the permeant decreases and as the non-polar nature of the permeant increases, there are still some apparent anomalies in the polythene permeability data which must be explained by other means. Dipole moments are useful for this purpose. As an example, the case of ethanol and acetic acid diffusion through polythene may be cited. Ethanol is roughly half the size of the acetic acid dimer, and acetic acid has twice the oxygen/carbon ratio of ethanol. It would thus be expected that ethanol should have the higher P^*. However, P^* for acetic acid is approximately nine times P^* for ethanol. Inasmuch as the dipole moments of the two compounds in the vapor phase are about equal, it

Table X.—Activation Energies of Polythene Permeability

Vapor	E_p
	Cal/mol
Water	6,750
Hexane	9,500
Carbon tetrachloride	10,000
Benzene	11,000
Acetic acid	11,500
Ethanol	13,700
Ethyl acetate	13,900

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is probable that acetic acid acts, at least partly, as the dimer during its solution in and diffusion through polythene. A decrease in moment from 1.7 to that of the dimer (probably around 0.8) makes the high permeability of polythene to acetic acid appear to be more reasonable.

The higher permeability of polythene to butylamine as compared to butyl alcohol may also be related to the lower dipole moment of the amine inasmuch as the two are quite similar in other respects. Again, butyraldehyde and butyric acid might be expected to exhibit widely varying permeability rates, were it not that the high dipole moment of the aldehyde tends to overcome the effect of the higher oxygen/carbon ratio produced by the acid.

It will be observed from the data of Table VIII that P* varies with the thickness of polythene film for some vapors and remains approximately constant for other vapors. Inasmuch as the calculation of P* involves a thickness term, constancy of P* with thickness changes indicates that the permeation rate is inversely proportional to film thickness. This situation is true of the permeability of polythene to water, the alcohols, acetone, acetic and butyric acids, and butyraldehyde. However, such rapidly diffusing compounds as butyl ether, butyl amine, hexane, and benzene show increasing P* values with increasing polythene thickness. This means that a unit volume of a thicker polythene film is more permeable to these vapors than a corresponding unit volume of a thinner polythene film.

Although the explanation of this phenomenon can not be stated with certainty at this time, the available data are consistent with the following hypothesis: The structure of thick polythene films is probably less compact than that of thin films because of the manner of solvent escape during film formation. The less compact structures will dissolve more of a soluble diffusing compound than will more compact structures, and that part of the diffusion of vapors which is due to solution will be increased. This supposition is supported by the fact that P* increases with increasing polythene thickness only for those compounds which are relatively highly soluble in polythene. A similar explanation of this phenomenon may be that polythene is composed of a "skin" and a "core", the two parts increasing at different rates with increasing thickness and each having its own characteristics.

Effect of Film Combinations

Study of Table III indicates that it should be possible to find some film which will be nearly impermeable to any given vapor. Other work has shown this to be true also with respect to gases. Therefore, it was reasonable to assume that a combination of films whose total individual barrier characteristics were good should itself be a good barrier for most types of vapors. It was found that none of the vapors tested would penetrate rapidly both unplasticized regenerated cellulose film and vinylidene chloride/acrylonitrile interpolymer films. Consequently, regenerated cellulose films coated with vinylidene chloride/acrylonitrile copolymer were tested and found to have low permeability to benzene, hexane, carbon tetra-

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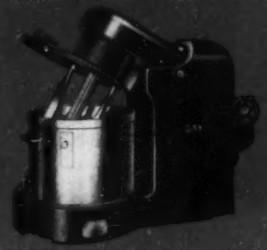

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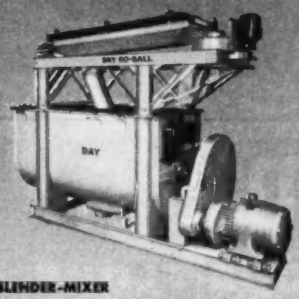

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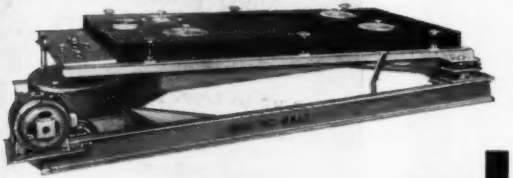
TYPE B THREE-ROLLER MILL

Solid one-piece cast iron frame with ribbed construction for high rigidity. SKF self-aligning roller bearings. Helical cut gears, running in oil, for smooth, quiet operation. High grade electric furnace chilled rolls, independently adjusted. Silent chain drive.



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chloride, ethanol, and water vapors. Other combinations of films with potentially interesting barrier properties may be selected readily from the data of Table III.

Effect of Temperature

Increasing temperature generally results in increased permeability of polymeric films to vapors. Of course, the pressure of the vapor, and thus the driving force of the diffusion process, increases with temperature, but this effect does not show up in the permeability constant P*. A further increase in permeability should be brought about by the increase in mobility of the polymer molecules with higher temperatures. This effect is reflected in larger P* values as illustrated by the data for polythene and several vapors in Table IX. It will be seen from these data that P* for organic vapors approximately doubles for each 10° C. rise in temperature. It has been shown previously (3) that this doubling for P* for each 10° C. rise holds also for the diffusion of water vapor through Pliofilm and Vinylite.

The temperature dependence of the permeability constants for permanent gases is exponential (2) and may be expressed by the following relation:

$$P^* = P_o^* \, e^{\frac{(-E_p)}{(RT)}}, \text{ where}$$

$P_o^* = P^*$ at infinite temperature
E_p = permeability activation energy

Applying this equation to the data of Table III, E_p values were calculated for the diffusion of water and six organic compounds through polythene and are presented in Table X. These data indicate that the structure of polythene is much more compact toward ethanol and ethyl acetate than toward water. This may be explained on the basis of the relative sizes of the three molecules. The relatively lower E_p values for hexane and benzene as compared to ethyl acetate and ethanol, despite the size of the former, are evidence that their permeabilities are relatively more dependent upon solubility than polar ester and alcohol.

Acknowledgment

The authors wish to express their grateful appreciation to Miss Mary Rickel and Miss Claire Kaiser who made the majority of the permeability determinations reported here.

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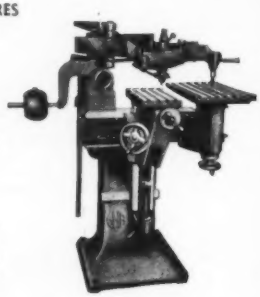

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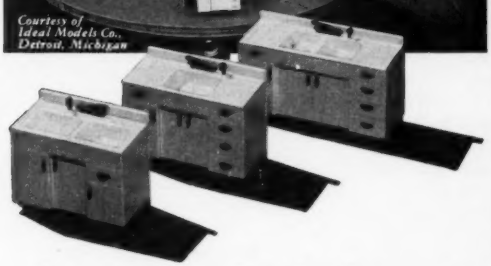

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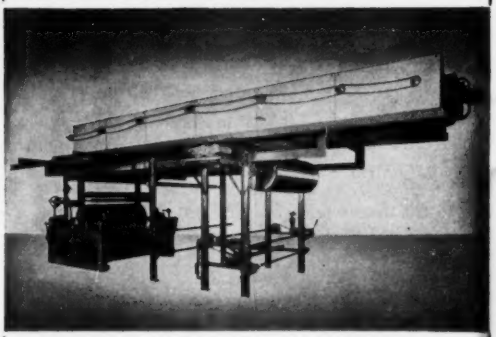

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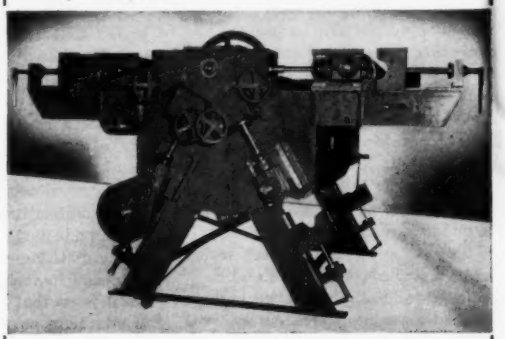

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Progress in Phenolic

MANY people have had their eyes on volume sales of phenolic molding material since it reached the unbelievably low point of 5,500,000 lb. in July, 1949, after reaching a high of nearly 20 million lb. in October, 1947. Some folks, who openly stated that phenolic molding compounds were on the way out after that kind of a performance, have had to eat their words, for sales in November of 1949 had zoomed back up to almost 15 million lb. and are currently running between 13 and 14 million pounds. There has not been much change in the type of products molded except that an increasing amount of phenolic is going into large molded pieces.

An interesting development in this trend is the increasing business done by midwest molders in comparison to those in other parts of the country. Among other applications, it has been estimated that 7 million lb. of phenolic molding materials were used for automotive ignition parts alone in 1949.

Insofar as phenolic producers are concerned, they have never seemed to show much alarm over a possible decline in their market. In fact, they have shown an increasing tendency toward optimism by constantly improving their line and bringing out new materials to add to what is already the most variegated selection of molding materials in any branch of the plastic industry. There seems to be no doubt that all these new materials and others of even greater interest now in development will add to the versatility of the phenolic industry and thereby increase its volume by several million pounds within a comparatively short time.

We are indebted to Mr. A. W. Hanmer, Jr., vice president in charge of molding compounds sales for Durez Plastics & Chemicals, Inc., for the following brief review of new phenolics which his company has added in the past two years.

A new mineral-filled high heat resistant material which will stand 450° F. for 100 hours. It has withstood 500 hr. at 450° F. with only slight effect on physical properties and finish. It is ideally suited for such things as handles for roasting pans, but will presumably find new fields where phenolic has never been employed before;

An intermediate pressure phenolic which requires only half the pressure needed for molding standard general purpose compounds;

A low pressure phenolic which requires only one-third the pressure of general purpose compounds;

Three new compounds, designed especially for washing machine agitators, that will retain their luster after repeated submerging in hot water and detergent solutions. They have faster cure and better dimensional stability than any other agitator material the company has ever produced;

A nodule-form molding compound that has better flow characteristics than bulkier compounds;

A fast-curing material used for battery vent plugs because of its particular resistance to battery acids. The same material is applicable to textile machinery parts because of its chemical resistance;

An amber transparent material developed particularly for use in X-ray machine parts;

Special materials for use in electrical parts that have silver contacts to eliminate corrosion formerly encountered.

In addition, says Mr. Hanmer, most phenolic raw material companies produce at least 15 new materials every year, in addition to improving existing compounds. Many of these are intended for some specific item which the general public, and often most molders, know nothing about, since they are not particularly concerned with the particular application for which the materials are formulated.

Thermoplastic Adhesive

A PLASTIC cement called Dekadhese—reported to be colorless, of good clarity, cold setting, to remain permanently flexible, and not to crystallize or become brittle—has been announced by the Hayes Research Co., 678 Massachusetts Ave., Cambridge 39, Mass. It is recommended particularly for cementing glass, acrylic, and cellulose and vinyl plastics.

The adhesive is a thermoplastic resin with a dry film softening point of 230° F. It is being used particularly by radio assembly plants in applications which require adhesion of various types of materials to each other.

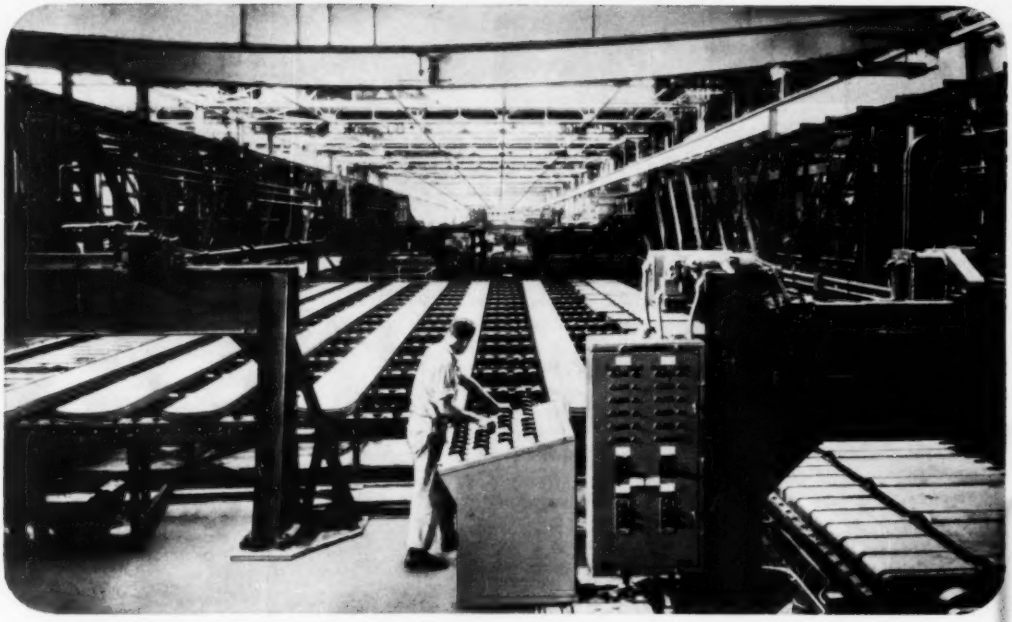
Non-Toxic Plasticizer

ONE reason why the use of vinyl film as a packaging material has been slow in developing is the necessity for incorporating a plasticizer in the compound. Vinyl coatings are widely used in such things as beer cans, milk containers, milk tanks, paper milk bottles, and many other food containers—but in such cases the solvent is driven off during manufacture and only pure vinyl resin is left on the surface of the container.

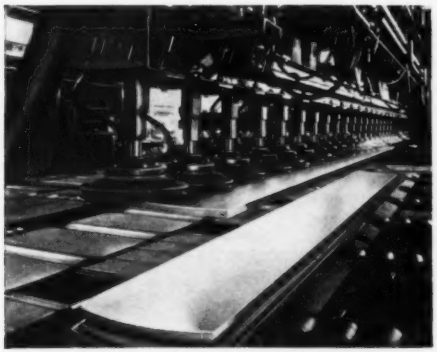
An announcement from Monsanto Chemical Co. indicates that it believes it has taken a long step forward in ameliorating the toxicity problem in other types of vinyl compounds by the formulation of a non-toxic phosphate-type plasticizer called Santicizer 141. According to Monsanto, the plasticizer has been accepted by the Bureau of Animal Industry, Department of Agriculture, as a non-toxic plasticizer for products to be used in processing and packaging of meat and meat products. The product has been in commercial production for more than two years, but has just recently passed all the requirements of the Meat Inspection Div. of the Bureau of Animal Industry.

It is expected that the availability of thin vinyl chloride film containing Santicizer 141 will give new impetus to the self-service mer-

*Reg. U. S. Pat. Office.



TO BUILD OR NOT TO BUILD



The smaller illustration is of the vacuum cup handling equipment operating in conjunction with the 2-Hi Cold Rolling Mill. Because of the massive size and weight of individual brass bars, all handling is mechanical.

This Mill, designed and constructed by Stone & Webster Engineering Corporation, is capable of producing the heaviest non-welded coils of strip brass, and includes the largest cold breaking-down mill in America.

For Scovill Manufacturing Company, Stone & Webster Engineering Corporation carried on continuing studies of the client's production operations over a period of four years. Analysis was made of production pattern for anticipated requirements, with costs of production in proposed mills compared with costs in the existing plant.

Companies today, faced with improving production facilities or lowering cost of plant operation, find comprehensive engineering reports by Stone & Webster Engineering Corporation valuable in developing sound, long range production plans.

STONE & WEBSTER ENGINEERING CORPORATION

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PLASTISCOPE

chandising of pre-packaged meat and other products.

In addition to its non-toxic properties, Santicizer 141 is flame resistant, offers processing advantages, and is of very low volatility with light stability equal to or better than other plasticizer types, the firm reports. Santicizer 141 is generally used in a vinyl film at a concentration of 20 to 30% by weight. Film 1 to 2 mils thick may be prepared by casting from solution or from organosols or plastisols. Film 2 to 3 mils in thickness may be prepared by calendering as well as casting techniques. In the casting field, stabilizers are not as essential as in the manufacture of calendered film, and film may be prepared without any stabilizer or with suitable non-toxic stabilizers.

Santicizer 141 is suggested particularly as a plasticizer for packaging film intended for fresh and frozen meats, processed meats, poultry, lard, oleomargarine, butter, and fish. It can also be used for candy, cakes, fruits, and condiments.

In addition to its use in packaging film, the new plasticizer is also suggested for vinyl formulations that are intended for such things as beverage tubing, baby pants, hospital sheeting, dress shields, drum lacquers, or other products in which toxicity is recognized as a problem.

A technical bulletin containing preliminary toxicity data on Santicizer 141 is available from the company on request.

Dry Laminate

AFTER several years of experimentation, Flexfirm Products, 1200 Chico Ave., El Monte, Calif., is producing a dry polyester laminate called Dryply. This is a cloth or mat impregnated with a polyester-type resin to which a catalyst has been added. The laminate is shipped to the customer in a dry state ready for lay-up. The resin used is somewhat different from the styrene polyester generally used in wet lay-ups but gives about the same properties to the laminate as are generally associated with the polyester-type material. The producer claims that thin sections can be cured in 15 sec. or less; if necessary, the temperature can be raised to 300° F. in order to obtain this quick cure. Shelf life is six months or longer at normal room temperatures.

Dryply laminates do not stick to each other in storage, and there is no liner to remove. The material can be unrolled like a roll of paper with no danger of pickoff between layers.

The initial cost of Dryply is claimed to be lower than the combined cost of glass, resin, and labor of hand impregnating. Use of it will save up to 50% in the final cost of the finished product because of the time and labor saving involved, says the producer.

It is claimed that high tensile and flexural strength combined with light weight make Dryply, pound for pound, one of the strongest structural materials known. Exceptionally resistant to rot and mildew, it will withstand outdoor weathering for long periods of time. To date, the dry laminates have been used for aircraft tooling and for a 17-in. panelling at the bottom of the wall in cargo planes. It is recommended for decorative laminates, boxes, lockers, boats, and structural members where a light-weight, strong material is particularly essential.

Vinyl Resin Plant Expansion

ANNOUNCEMENT of a $2,250,000 expansion program which will quadruple the output of its Pliovic vinyl resin has been made by The Goodyear Tire & Rubber Co. The expansion will be made at the company's Pathfinder Chemical Corp. plant at Niagara Falls, N. Y., which will be managed by Frank Manchester. The original plant was built during the closing days of the war. Initial expanded production is scheduled to start before the end of the year. The process used by Goodyear joins acetylene and hydrogen chloride to form liquid vinyl chloride, to which is then added water, a catalyst, and an emulsifying agent to form a solid material.

Company publicity indicates that Goodyear will concentrate on producing a variety of resins, which will be developed to fit the particular needs of certain end products whether they are to be calendered, molded, extruded, or coated.

Testing Decorative Laminates

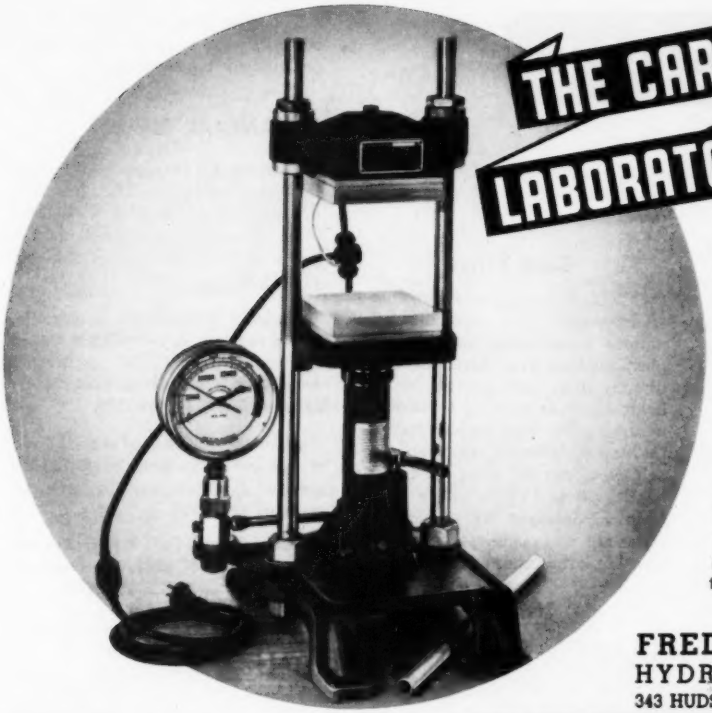
SOON to be made available is a standard method for testing decorative laminates for resistance to cigarette burns and to blistering from heat, according to the Decorative Laminate Group of the Laminated Products Section, National Electrical Manufacturers Association, 155 E. 44th St., New York 17, N. Y. This new standard is in addition to other standards for laminated thermosetting decorative sheets which were published a year and a half ago.

Polyethylene Extrusions

COMMERCIAL production of polyethylene film, sheeting, and seamless flat tubing has been announced by the Fibron Div., Irvington Varnish & Insulator Co., Irvington 11, N. J. Designated Ivithene and available in a greater range of widths and thicknesses than previously obtainable, the film and tubing can be used in packaging bulk chemicals and food products, in automatic bag machines, for industrial and protective sheeting, as electrical insulation, etc. These applications utilize the material's unique properties of negligible water vapor transmission, absence of plasticizer, unlimited shelf life, inertness to food substances and most chemicals, high dielectric strength, low-temperature flexibility, and resistance to abuse.

New Extrusion Company

ESTABLISHED by former employees of General Electric Co., a new firm has been organized at Sheffield, Mass., under the name Sheffield Plastics, Inc. Headed by Richard V. Pelton, president and treasurer, the administrative staff includes Harold R. Stover, in charge of engineering and production,



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PLASTISCOPE

Thomas W. Hinkley, administration and purchasing, and Clarence E. Moore, production.

Formed specifically to meet the growing demand for extruded plastics, the firm utilizes the dry extrusion method on which Mr. Pelton and Mr. Stover did experimental work while associated with General Electric.

Housed in a 2500-sq. ft. plant, the company's chief production to date has been diffusion panels for fluorescent lights. The firm plans to go into production of fabricated parts, such as luggage trim, pocketbooks, and belting.

Strike Settled

SHIPMENTS of plastics materials from the Plaskon Div. of Libbey-Owens-Ford Glass Co. resumed May 1, after a three month's shutdown due to a strike by Local 12 U.A.W.-C.I.O. The dispute was settled after the union withdrew its demand for an area-wide pension plan.

West Coast Styrene Plant

CONSTRUCTION of a new plant in Long Beach, Calif., for the production of styrene molding compound was recently announced by Felix N. Williams, vice president of Monsanto Chemical Co.'s Plastic Division.

Mr. Williams pointed out that this is the first styrene plant to be built west of the Mississippi river. It is the second California plant to be announced recently by Monsanto—the first was a plant for synthetic resins and coatings near Santa Clara. The styrene plant will begin production about August 1.

Mr. Williams paid a tribute to California by announcing that the new plant was evidence of his company's belief in the increasingly important role of California molders and fabricators and stated that many of the best-designed products in styrene plastics housewares have come from the west—that California originated the new hothouse caps and the lattice berry boxes as part of the advance guard of new product ideas that the West Coast is developing.

Heart Valves

DOCTORS are reported to have succeeded in replacing the natural heart valves of dogs with plastic valves. The valves are sewn directly into the interior of the heart either in place of or over the natural valve. The doctors indicate that the replacement operation, once perfected, can be tried on human heart valves which have been severely damaged by disease. No statement was made concerning the type of plastic used.

Stabilizer

AN organic hydrochlorophil called Stabilizer #900 is the latest addition to its line, according to an announcement by Ferro Chemical Corp., Bedford, Ohio. The material is said to provide exceptional heat stabilization at higher temperatures as well as good light stabilization when used with other stabilizers. It is not generally recommended for use alone. In addition to the usual stabilizer applications, the material, in combination with Ferro barium and cadmium stabilizers, is claimed to be effective where lead-free clear vinyl products are required.

S. P. I. Officers

THE Northern California Chapter of The Society of the Plastics Industry has elected the following officers for the coming year: L. N. West, president; N. J. Eireman, vice president; J. R. Akers, secretary; and George W. Harmssen, treasurer.

Chip Box

CLEVERLY illustrating some of the color possibilities of its contents is a chip box which is being used by Kayson Rubber & Plastics, Ltd., 144 Water St. S., Galt, Ontario, Canada, to contain the color samples or chips of its polystyrene molding material. The box, containing 36 color chips is molded of polystyrene with a clear cover and a pearlescent type base.

FINANCIAL NEWS

Formica Co. reports net income for the year ending Dec. 31, 1949, of $1,546,086 on net sales of $13,985,979 compared with a 1948 net income of $1,212,989 on net sales of $13,976,559.

National Rubber Machinery Co. had a net loss in 1949 of $31,332 on net sales of $3,717,721 contrasted with a net income of $285,624 on sales of $5,086,177 in 1948.

Shellmar Products Corp. showed a net profit in 1949 of $1,705,659 compared with a net the previous year of $2,027,092.

Glass Fibers, Inc., reported a net loss in 1949 of $265,356 compared with a loss of $567,240 in 1948.

Minnesota Mining & Mfg. Co. reported record dollar sales and net earnings for 1949 with net income of $15,398,176 compared with $13,234,756 in 1948. Net sales rose to $114,925,274, or up 6.2% from the record set in 1948 of $108,246,410.

Plants in Bristol, Pa., and Hastings, Minn., were completed in 1949, and a new tape manufacturing unit —a two-story, block-long $2,000,000 structure—was begun in St. Paul and will be completed next fall. A five-story $3,000,000 office building for St. Paul headquarters was approved last December. Not counting subsidiaries, the company has 14 plants and 21 offices in 15 states.

American Phenolic Corp. reported net profit for 1949 of $567,275 compared with $183,141 the year before. Sales in 1949 were $10,082,819, the highest since the war.

Rohm & Haas Co.'s 1949 sales of $62,422,792 showed only a slight change from the 1948 figure of $62,419,158, but the net earnings of $5,115,877, or $6.09 a share, increased from $4,289,922, or $5.25 a share in the previous year.

The company spent about $2,500,000 in 1949 on new construction. It plans an outlay of about $7 million in 1950, primarily for enlarging and improving existing facilities.

Progress was reported in the de-

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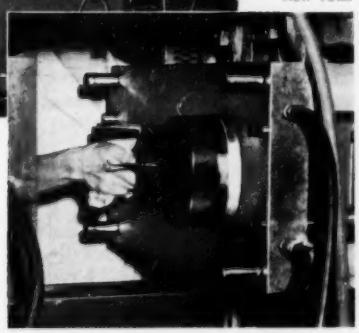

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velopment of a more complete line of ion exchange resins for industrial uses; further expansion in the use of Plexiglas for the coming year is also expected.

Stone Container Corp. showed a 1949 net profit of $1,137,512 against a net of $1,135,900 the previous year.

Dow Chemical Co. reports that sales for the fiscal year ending May 31, 1950, will be about 10% ahead of those for the preceding year when they were slightly in excess of $200 million. Company sales of polystyrene and saran rose about 25% over the previous year's volume.

American Cyanamid Co. achieved its largest sales and earnings in its history in 1949. The consolidated net earnings were $16,149,513 compared to $11,875,090 in 1948. Net sales in 1949 were $237,730,655 compared to $231,992,219 in 1948. Expenditures of $13,111,286 were added to plant investment in 1949, making a total of $102,754,871 in the last five years.

Union Carbide & Carbon Corp.'s annual report notes that sales declined to $585,000,000 in 1949 compared to $631,000,000 in 1948. During 1949 the company charged $27,500,000 against income for depreciation and depletion as compared to $21,700,000 in 1948. Net income was reported as $92,000,000 in 1949 compared to $102,000,000 in the previous year.

The firm continued its expansion program with $71,000,000 expended in that direction last year compared with $114,000,000 in 1948. New plants for chemicals and plastics cost $41,000,000. More than 40% of the company's sales are derived from products developed in the past 20 years.

Pantasote Co. net income for 1949 was $34,919 on sales of $4,167,665, contrasted with a loss of $417,857 in 1948 when sales were $4,690,662.

Clopay Corp. reports net income for 1949 of $97,465 on net sales of $9,757,223 compared with a 1948 net of $600,672 on sales of $12,237,988. The firm has been a leading manufacturer of paper drapes and has only recently taken over the production of vinyl drapes.

Sheller Mfg. Corp. had a net profit of $3,689,812 for 1949 compared with $2,677,288 for 1948.

COMPANY NOTES

Glass Container Div., Owens-Illinois Glass Co., Toledo 1, Ohio, has named **Edward A. Randlett** closure and plastics sales manager for the western region, with headquarters in the Chicago branch at 121 W. Wacker Drive. He will be succeeded as Baltimore branch salesman by **William J. Thompson.**

Synthane Corp., Oaks, Pa., laminator and fabricator of thermosetting plastics, is now producing tubes up to 26 in. o.d., 25¾ in. inside diameter. New tube-winding equipment accommodates a maximum tube length of 96 inches.

Vac-U-Met Process Co. is a newly formed concern located at Central Court, Leominster, Mass., which will specialize in metallizing plastics by high vacuum.

Monsanto Chemical Co. has announced increased capacity for production of Ultron vinyl resin which became available in April. The company also announces a price reduction of 2 cents a pound for Santicizer 141 and a 4 cent a pound reduction for phthalic anhydride.

The Formica Co., Cincinnati, Ohio, has announced purchase of a site adjoining the former Wright Aeronautical Corp. plant for construction of a $7 million factory. The first step will consist of the erection of a $1 million building by late fall. The expansion program will be increased immediately 25 to 30% and perhaps will be doubled later, according to **D. J. O'Conor,** president of the company.

Sinko Mfg. & Tool Co. has moved to 3135 W. Grand Ave., Chicago, Ill., a new building with 19,000 sq. ft. of floor space. Its injection molding equipment ranges from 4 to 60 oz. in capacity and is supplemented by facilities for metal stamping and assembly. Company officers are **John Sinko,** president; **Howard O. Nielsen,** secretary and treasurer; **Henry L. Miller,** plant superintendent; **Nickalas P. Andrews,** plastics sales manager, and **R. M. Brosius,** auto accessories manager.

St. Regis Paper Co. (Canada) Ltd. has announced the formation of a Panelyte Div. which will supply the Canadian market for refrigeration, industrial, and decorative Panelyte, the company's laminated plastic. A new plant to be located at St. Johns, Quebec, with production scheduled to commence by late fall, is part of the division's expansion program which includes another new plant at Kalamazoo, Mich., expected to be in full production this summer.

United States Testing Co., Inc., Hoboken, N. J., has moved its New York City offices to the McGraw-Hill Building, 330 W. 42nd St. The office will be managed by **Thomas C. Ridgway.**

Radio Corp. of America announces it has resumed merchandising and sales of its line of industrial electronic equipment, thereby terminating present distribution arrangements with Allis-Chalmers Mfg. Co. **Eriez Mfg. Co.,** Erie, Pa., is the new distributor for the company's electronic metal detectors. **A. H. Hofberg** has been appointed manager of R-F heating products and will head sales of both dielectric and induction heating equipment.

Mount Hope Machinery Co., manufacturer of cloth, paper, and plastic handling equipment for the textile, paper, and plastic industries, has announced purchase of larger quarters at 15 Fifth St., Taunton, Mass.

Plax Corp., Hartford, Conn., announces the establishment of new sales offices at 2615 Fannin St., Houston, Texas, headed by **E. W. McKinney;** and in Cincinnati, Ohio, where **A. F. Duemler, Jr.** will have headquarters at 104 E. 4th St.

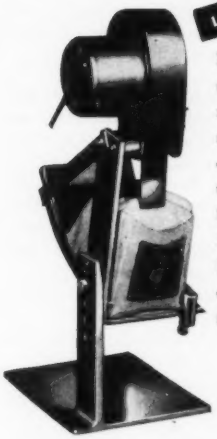
Clarvan Corp., Milwaukee, Wis., has named **Ira Gold** sales manager, Toy and Premium Div., and **R. J. Newell** sales manager, Consumer Goods Div. **Walter E. Quinby** has

use this Bagger

FOR FASTER PACKAGING

LOW IN COST

EASY TO USE



Designed to handle bagged products with a minimum of effort at a maximum speed. Simple adjustments for height . . . tilting forward or backward enables the operator to set machine at easiest position. Stainless steel trough with capacity of 200 bags . . . adjustable to bag sizes. Blower, equipped with air filter, opens bag and keeps it free from foreign matter. It's a time saver!

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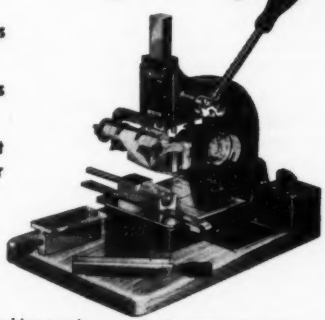
Uniform, clean-cut stampings in gold or colors.



Write us about your marking requirements. Enclose a sample or dimensions of part to be stamped. We'll reply air mail with complete details on how a Kingsley Machine can be applied to *your specific need.*

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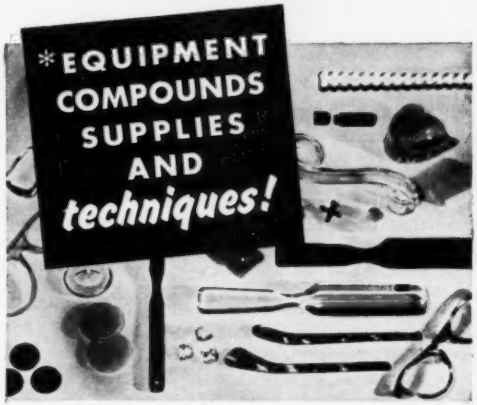
PROCESSES



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TUMB-L-MATIC is an all new process for definning, cutting, smoothing and polishing plastics at highly profitable speeds that cut finishing costs substantially. Gearing important new developments in automatic finishing to years of experience in applying scientifically combined equipment, compounds, supplies and techniques to a wide range of products, TUMB-L-MATIC PROCESSES are available for individual application to your product.

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Our experienced engineers analyze a sample (or detailed description) of your product, recommend an individualized, low-cost TUMB-L-MATIC PROCESS complete with production data which enables you to figure finishing costs before you invest a cent. Write and tell us about your product—or better still, send a sample.

AND REMEMBER, TUMB-L-MATIC makes *the complete line* of tumbling and burnishing equipment, compounds and supplies.

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PLASTISCOPE

been promoted to sales manager, Custom Consumers Div., and **Roger W. Rodgers** has joined the firm as manager of industrial sales.

Koppers Co., Inc., Pittsburgh 19, Pa., has named **Gen. Brehon Somervell**, president of the company since 1946, chairman of the board of directors. He succeeds **J. P. Williams, Jr.**, who recently retired. **W. F. Munnikuysen**, vice president and general manager of the Wood Preserving Div., was made executive vice president of the company.

Plax Corp., Hartford, Conn., is now offering annealed methacrylate rod, which machines without crazing or cracking, at a cost of only 5 cents above the price of regular rod.

Wagner Plastic Corp., 6500 Hudson Blvd., W. New York, N. J., is a new company which will take over the plant and equipment of Clinford Corp. The company will do injection molding as well as finishing and assembly of plastic items. **Walter Wagner**, head of the new company, former WPB official in the Plastics Div., and president of the Walter Wagner Corp., will continue to operate the latter company as a separate sales concern at 303 W. 42nd St., New York 18, N. Y., under the direction of **J. K. Moloney**.

The Dow Chemical Co. has announced that building is in progress on a new plant at Freeport, Texas, for expanded latex production and is scheduled for completion about June 15, 1950. It is one of two new plants to be built for latex coating materials used by the paper, textile, and paint industries.

The Midland latex plant, where the material has been manufactured for the last three years, was recently damaged by fire. It is being rebuilt and is expected to resume operations June 15, 1950.

Morton-Withers Chemical Co., 2110 High Point Rd., Greensboro, N. C., has been formed as successor to Morton Chemical Co., producer of textile auxiliaries. The company has just announced the production of a new plasticizer, octyl phthalate, which is claimed to have superior aging properties.

E. I. du Pont de Nemours & Co., Inc., has announced plans for construction of a new unit at Camden, S. C., for the manufacture of Orlon acrylic fiber in staple form. The new factory will be a separate unit adjoining the plant being built for manufacturing Orlon in the form of continuous filament yarn.

Pyramid Plastics, Chicago, Ill., is now extruding vinyl over flexible metal tubing for use as control cable in automotive parts and kindred applications.

The Watson-Standard Co., 225 Galveston Ave., Pittsburgh 19, Pa., has announced the development of a series of vinyl lacquers for vinyl molding, which are applicable to the rigid and the semi-rigid type of molding. Claimed to have excellent properties of wearability, adhesion, and flexibility, they can be used for the decoration of toys and dolls molded from vinyl plastisol type of compounds.

Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y., industrial consultant in chemistry, bacteriology, and engineering, has purchased the laboratories of **G. C. Supplee Research Corp.**, Bainbridge, N. Y.

Sylvania Electric Products, Inc., Warren, Pa., is now offering general purpose and low-loss dielectric molded phenolic plastic products for the electrical and electronic industries. Available in black, white, or colors, the parts may be supplied as molded pieces, as sub-assemblies with staked, eyeletted, or stitched metal parts, or as complete assemblies of molded plastic and small metal parts.

F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa., has entered the field of vacuum metallizing with complete equipment for the metal coating of such products as plastics, crystals, glass, paper, textiles, lenses and optical parts, light reflectors, jewelry, and ornamental pieces. The company will furnish package installations consisting of vacuum chambers, vacuum pumping units, product mounting assemblies, and complete vacuum instrumentation.

B. F. Goodrich Chemical Co. has announced that construction of an applied research laboratory, third unit in the multi-million-dollar installation at Avon Lake, Ohio, has recently begun. The new one-story building will cover 17,500 sq. ft. and will have separate materials and processing laboratories, a compounding room, Banbury mixing room, and controlled temperature test room, in addition to administrative offices.

A general chemicals plant and experimental unit are now in operation.

Flexible Tubing Corp., Branford, Conn., has announced that **Wesley L. Guiles** has joined the company as technical representative, and that **Jack F. Chapin** has been named development engineer.

Magnus Harmonica Corp., 439 Frelinghuysen Ave., Newark 5, N. J., producer of harmonicas accordions, concertinas, and other plastic musical toys, has established a Chicago sales office headed by **Albert E. Burgin.**

Vacuum Metalizing Corp., 32-36 Greenpoint Ave., Long Island City, N. Y., has announced that its new vacuum equipment, motivated by patented pumps imported from England, started operating in May in cycles of 17 min. compared to the old rate of 65 to 70 min. under full load of plastics.

Anchor Plastics Co., Inc., extruder of thermoplastics, has taken over an additional floor in its offices at 533-541 Canal St., New York 13, N. Y. This is in line with the company's plans to increase production for television and packaging.

J. B. Products Corp., 1717 N. Ashland Ave., Chicago, Ill., has announced the installation of a new 36-in. vacuum system for plating plastics by the distillation process.

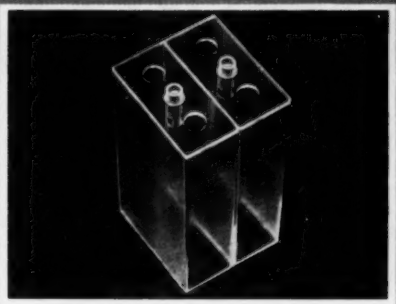
(*Continued on p.* 170)

"designed right—in the right plastic"

CUSTOM MOLDERS' KNOW-HOW plus

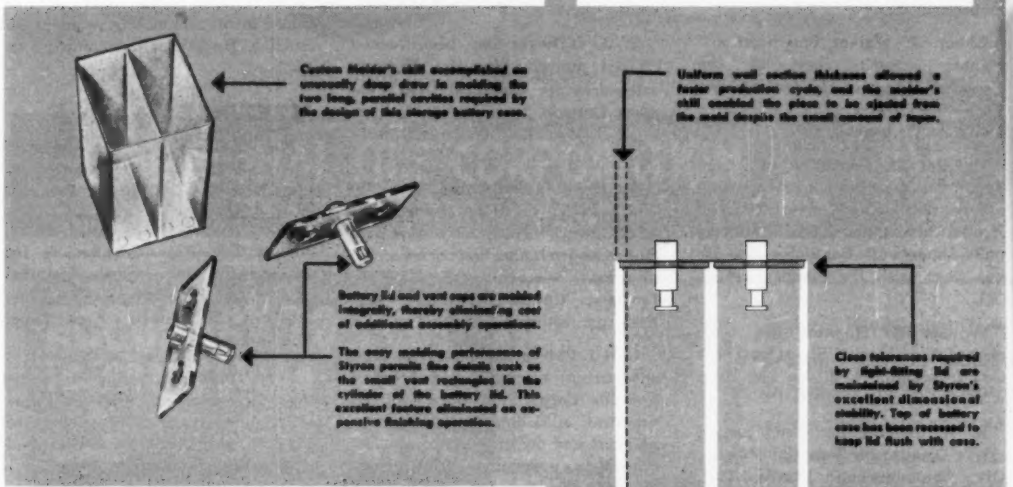
STYRON

solves another production problem!



ANOTHER CUSTOM MOLDING CASE HISTORY

The Custom Molder specified Styron as the material for this sturdy storage battery case. This selection was based on Styron's excellent resistance to chemicals or battery acids . . . dimensional stability . . . rigidity . . . low moisture absorption and superior molding performance that meant a low unit cost for this storage battery case.


Custom Molder's skill accomplished an unusually deep draw in molding the two long, parallel cavities required by the design of this storage battery case.
Battery lid and vent caps are molded integrally, thereby eliminating cost of additional assembly operations.
The easy molding performance of Styron permits fine details such as the small vent rectangles in the cylinder of the battery lid. This excellent feature eliminated an expensive finishing operation.
Uniform wall section thickness allowed a faster production cycle, and the molder's skill enabled the piece to be ejected from the mold despite the small amount of taper.
Close tolerances required by tight-fitting lid are maintained by Styron's excellent dimensional stability. Top of battery case has been recessed to keep lid flush with case.

Molded for Electric Storage Battery Company, 19th and Allegheny Avenue, Philadelphia, Penna., by Bridgeport Moulded Products, Inc., P. O. Box 3276 Barnum Station, Bridgeport 5, Conn.

Valuable experience is offered to you by the Custom Molder in designing the right plastic into finished products at low unit cost. Let the extensive design and engineering facilities of the Custom Molder solve your fabrication problems in plastics . . . quickly and economically. From a wide range of Styron (Dow polystyrene) formulations, the Custom Molder selects the right plastic for your product.

Working closely with Custom Molders, Dow's competent and experienced technical staff helps them utilize Dow Plastics to the best advantage in your products. Write Dow today for technical bulletins that give information on the properties and performance of various Dow Plastics . . . also, let us put you in touch with a qualified Custom Molder who can solve your production problem.

Plastics Division—Dept. SOT-30

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PLASTISCOPE

This equipment supplements present facilities for spraying, stamping, and assembling operations. **L. J. Swift,** formerly vice president in charge of production for Sandee Mfg. Co., Chicago, Ill., has joined the firm in a sales engineering capacity.

PERSONNEL

Alan S. Cole has just been elected vice president of all the Breskin publications. Mr. Cole will also continue in his capacity as general manager.

Elmer D. Walker has been appointed superintendent of the Coshocton plant of **General Electric Co.**'s Laminated and Insulating Products Division.

Douglas M. Considine has been appointed manager of the market extension division, general sales, of **Brown Instruments Div., Minneapolis-Honeywell Regulator Co.** He has been with the company since 1941.

William R. Hopkins has been elected treasurer of **Shaw Insulator Co.,** Irvington, N. J. He has been with the firm since 1944.

R. W. Ebeling has been named sales manager for **Superior Plastics Div., Commonwealth Plastics, Inc.,** 414-430 N. Oakley Blvd., Chicago 12, Ill. He succeeds **Joseph Edelston** who has taken over the duties of administrative executive.

Clifford B. Mueller, Jr., has been named general sales manager of **The Brunhoff Mfg. Co.,** 1825 Freeman Ave., Cincinnati, Ohio, manufacturer of displays and metal specialties, and contract fabricator for all types of metal and plastic items. Mr. Mueller was previously with The Schaible Co.

Earl R. Dodd will head the Adhesive Divs. of **American-Marietta Co.** in Seattle, Wash. and New Westminster, B. C., Canada. The Seattle operations will combine their management activities with those of American-Marietta Co. of Canada, Ltd., of which Mr. Dodd has been manager since its inception.

George E. Baer, Sr., has joined **Arnold Brilhart, Ltd.,** Old Country Rd., Mineola, L. I., N. Y., as part of the New England staff. He was formerly sales engineer for General Electric Co.

James R. Patterson has been named West Coast manager of **Chemicals Div., General Electric's Chemical Department.** His headquarters will be at the Anaheim, Calif., plant.

T. J. O'Dwyer has been named district manager for the Midwest sales area for **Chemical Div., Celanese Corp. of America,** 180 Madison Ave., New York 16, N. Y. His offices will be in Chicago and Detroit.

Raymond H. Blanchard, formerly vice president of **Hood Rubber Co.,** Watertown, Mass., a division of **The B. F. Goodrich Co.,** has been elected president, succeeding the late **C. Lawrence Munch.** He has been with the organization since 1917.

Carl J. Parsch has been appointed advertising manager of **Acheson Colloids Corp.,** Port Huron, Mich., producer of colloidal graphite dispersions and coloring materials. Mr. Parsch was previously with Simons-Michelson in Detroit.

William Crumpton has been named fabric sales manager for **Lumite Div., Chicopee Mfg. Corp.,** New York, N. Y. maker of screening and fabrics. He was formerly in charge of sales in the southeastern states where he will be succeeded by **Roy W. Smith.**

J. C. Poole has been promoted to director of purchases for **The Hydraulic Press Mfg. Co.,** Mount Gilead, Ohio. In addition to his new services, he will remain assistant secretary of the company.

Richard L. Huber has been appointed to the product promotion and market development division of **Cellulose Products Dept., Hercules Powder Co.,** Wilmington, Del. Mr. Huber will remain in Cleveland where he has been sales representative. He has been with the company since 1942.

Edward Small, Jr., formerly with General Electric Co. in its Laminated Plastics Div., is associated with **Krafelt Corp.,** Du Pont Building, Wilmington 41, Del., in a sales, service and consulting capacity.

John H. Drexler has been transferred to the Boston office of **Carbide and Carbon Chemicals Div., Union Carbide and Carbon Corp.**

Deceased

Delmer C. Eldredge, Eastern Div. sales manager of **Fibre Drum Section, Continental Can Co.,** 100 East 42nd St., New York 17, N. Y., was killed in an automobile accident on April 5. He joined the company in 1942.

MEETINGS

May 28-31—American Institute of Chemical Engineers, Regional Meeting, New Ocean House, Swampscott, Mass.

June 1-2—American Society for Quality Control, Fourth National Convention and Fifth Midwest Conference, Milwaukee Auditorium, Milwaukee, Wis.

June 20-22—Massachusetts Institute of Technology Plastics Committee, Mechanical Properties of Plastics, Massachusetts Institute of Technology, Cambridge, Mass.

June 26-30—A.S.T.M. Exhibit of Testing Apparatus and Related Equipment, Atlantic City, N. J.

July 22-27—New York Curtain and Drapery Show, New York.

Aug. 7-19—United States International Trade Fair, Chicago, Ill.

Sept. 5-9—Chicago Section of the American Chemical Society, Sixth National Chemical Exposition, Chicago Coliseum, Chicago, Ill.

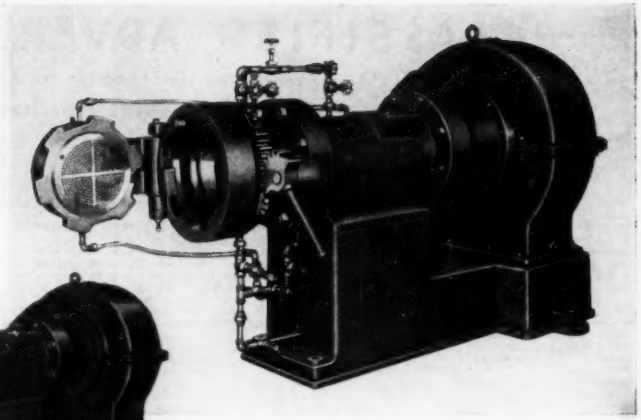
S.P.E. Meetings

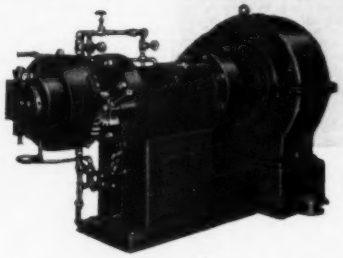
June 21—New York Section of S.P.E. at Hotel Shelburne, New York, N. Y. A representative of Carpenter Steel Co. will speak on plastics mold steels.

6" Strainer

WITH SLABBING HEAD

Here is just another of the many examples of National-Erie design . . . the result of nearly a half century in engineering and producing machines for rubber and plastics working. Mechanical features are incorporated in NE strainers which have always resulted in year in year out operation at lowest cost. Let us consult with you on your rubber or plastics machine needs.





ABOVE: 6" strainer with combination slabbing head in open position.

LEFT: 6" strainer with combination slabbing head in closed position.

Complete Rubber and Plastics Working Machinery

NATIONAL ERIE CORPORATION

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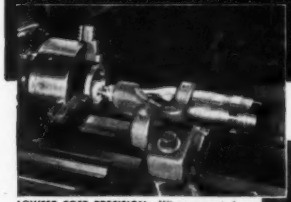
ACCURACY TO .0001"
IN PRODUCTION SET-UPS

FOR AS LITTLE AS **$117.50**



Internal grinding on lathe with PRECISE wheel arbor mounting 1½ O. wheel.

LOWEST COST PRECISION. When mounted on standard machine tools, PRECISE SUPER 40 at speeds from 20,000 to 45,000 R.P.M. turns out precision jobs heretofore possible only on stationary machines costing up to 100 times as much.

VERSATILITY. For cylindrical, internal, external and form grinding; for milling with H.S. steel or tungsten carbide midget mills; for micro-finishing and polishing. Use on wood, glass, rubber, plastics, or any metal including the hardest alloy steel.

DURABILITY. All metal housing, rigid PRECISE quill, lubricant-sealed micro-precision bearings. ¼ H.P. AC-DC motor (115 volts) is protected by replaceable fusetrons.

ATTACHABLE COOLFLEX SHAFT. (optional) Quickly attached for bench work and handtool applications. Same speeds, same precision quill as in PRECISE SUPER 40.

Milling hardened die with tungsten carbide mill in COOLFLEX ATTACHMENT.

Write FOR CIRCULAR

PRECISE PRODUCTS CO., 1348 Clark St., Racine, Wis.

PRECISE SUPER 40

Reduce Pre-Mixing Time. Secure Complete, Uniform Dispersion of Plastics Ingredients. Profit from Improved Color Blending with the

"ENTOLETER" CENTRIFUGAL MIXER

The "ENTOLETER" Mixer provides the simplest, most economical method of producing a homogeneous mix. It is easy to install and operate. Requires only 12 cubic feet of space; yet can produce a finished mix at rates up to 200 lbs. a minute. It is adaptable to either continuous or batch mixing. Send for bulletin and reprint describing results on plastics applications. Entoleter Division, The Safety Car Heating & Lighting Co., Inc., 1195 Dixwell Ave., New Haven 4, Conn.

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Machinery and Equipment FOR SALE

FOR SALE
1 Laboratory size heavy duty double arm jacketed mixer—3 interchangeable rotors and 3 covers.
4 Heavy duty double arm jacketed mixer; Day 25 gal. W&P 100 gal., Read 150 gal.
PERRY EQUIPMENT CORP.
1529 W. Thompson Street, Phila., 21, Penna.

FOR SALE: NRM Package Unit plastic wire covering machine, slightly used. Consists of 1½" oil heated extruder, crosshead for max. of ¼" dia. covered wire, dual horizontal water cooled haul-off capstans, automatic driven let-off controlled by wire tension, torque controlled dual take-up. 220V 2 phase. Can be operated for inspection. IRVINGTON VARNISH & INSULATOR CO., 6 Argyle Terr., Irvington 11, N. J. Essex 3-4200 Ext. 6

FOR SALE: Farrell 18" x 45", 16" x 48" & 15" x 36", 2 roll rubber mills. New 6" x 12" Lab. mixing mills & calenders. Other sizes 30" to 84". Royle #2 perfected extruder, and other sizes. 500 ton Hydr. molding press 42" x 48". Field 500 ton 28" x 36". Francis 175 tons 24" x 18". W.S 115 ton 2 opening 24" x 24". 450 ton broaching press. Also presses 20 to 500 tons from 12" x 12" to 36" x 36". Hydr. oil pumps. Vickers, Oilgear, Northern, etc. Watson Stillman hor. 4 plgr. 1¼" & 2½" x 4" H & L pressure pump. HPM 1—5" x 6" vertical triplex 10 GPM 2700 lbs. Elmes 1" x 4" & 1—1¼" x 4" hor. 4 plgr. 5 & 8 GPM 4500 lbs. & 5500 lbs. Elmes 2" x 6" Horiz. 30 GPM 2500 psi. Rumsey 4¼" x 8" vert. triplex 65 GPM 900 lbs. Hydr. steam pumps. Low pressure pumps 150 to 600 lbs. Hydr. accumulators. Stokes automatic molding presses. Stokes rotary preform tablet machines 1—3/16", 1—⅜" and ⅝", also single punch. Injection molding machines 2 oz. to 16 oz. Baker Perkins jacketed mixers 200, 100, 50, and 9 gals. capacity. Leominster 5 hp. plastic grinder. New and used rotary cutters, #18H Mikro pulverizers, & other sizes. Rubber mills, calenders, #00 Banbury mixer, etc. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. Stein Equipment Co., 90 West St. N. Y. 6, N. Y. WOrth 2-5745.

FOR SALE: 100 Ton and 150 Ton Stokes Molding Press & Pumps; 200 Ton H. P. M. Self Contained Molding Press; 300 Ton Dunning & Boschert Molding Press; 300 Ton W. S. New Hobbing Press; 300 Ton W. S. Press 24 x 20 Platens; 175 Ton H. P. M. 30 x 30 Platens; 85 Ton Stewart Boiling 20 x 20 Platens With Electric Plates; 50 Ton 18" x 18" Elmes, With Electric Plates, Handpump Operated; 500 Ton Waterbury Farrel 3 Post Press; 800 Ton Waterbury Farrel 22" x 24" Platens; Watson-Stillman 75 Ton 15" x 15" Platens; 35 Ton Oilgear Shaft Straightener 84" Long Bed; Carver & Watson Stillman Lab. Presses; Hydro Pneumatic & other type Accumulators; Piston & Oil Pumps. AARON MACHINERY CO., 45 Crosby St., N.Y.C.

HYDRAULIC PRESSES REBUILT TO SPECIFICATIONS for plastic items, industrial purposes and phonograph record presses. We have in the used equipment (1) Baldwin-Southward 8" x 8' stroke, 2000# W. P. weighted accumulator $2000, (1) 400 ton, 32 x 45, 18" ram, 36" stroke, 12' daylight $2200 (1) 300 ton 30 x 46, 18" ram, 24" stroke, $1800, (1) 400 ton 22 x 30, 16" ram, 18" stroke, 36" daylight $1500, (2) 150 ton 42 x 46, 12" ram, 36" stroke, 60" daylight $900 each, (6) 250 ton 32 x 66 12" double ram, 42" daylight, 15" stroke, flange type packing $1850 each. Hydraulic Sal-Press Co., Inc., 386-390 Warren Street, Brooklyn 2, New York.

SPRAY DRYER FOR SALE Galvanized, direct gas fired, capacity 400 lbs. water hourly, requires 1800 cubic feet gas hourly. Priced for quick sale. Box 549, Modern Plastics.

For Sale—One Van Dorn One Ounce Injection Press Model H-200. Slightly used—in perfect condition. Moving our plant June 1. Will sell with or without button molds at attractive price.
Emberglo Potteries, 203 E. 8th Street, New York 3, NY.

FOR SALE: Four Stokes Model 200A automatic molding machines in very good condition with 5 HP motors $700 each. One NRM 2½" Plastic Extruder with oil heating unit. One Watson-Stillman 8 oz. Injection Molding Machine. Priced reasonably. Reply Box 541 Modern Plastics.

FOR SALE: Injection Presses: 2, 4 & 12 oz HPM, Bench 1 oz vert. NRK, 1 oz VanDorn. Extruders: NRM Bench Lab unit, 2", 2½" NRM, 6" oil heatd. NE, 20', 40' conveyors. Ovens, Granulators. Tumbling Barrels, Temperature Circulators. Apex rd obj. Printing mach. Preco Lab press. 1—HPM 9 oz Hastelloy Heating Chamber. 2—Electronic HF Generators & Sealers, for Vinyls. 5 various types Compression Presses. 3—Birdsboro 8" ram 24" x 24" Pl. Compr. Press. 1—Laminat Press 10 op. 30" x 30" Pl. 1—Stokes 150 tons mod. 252 autom. closure press. 1—Stewart Boll. 100 ton Record Press. 1—Eclipse 3 HF gas boiler. Kux No. 50 single punch & Kux No. 23 rotary Preformpresses. Justin Zenner, 823 W. Waveland Ave., Chicago 13, Ill.

FOR SALE: STOKES PERFORMING PRESS, toggle type, #280-B, 80 tons, 2" fill and 4" diameter preform, with variable speed drive for AC 220-440 volts, 60 cycle, 3 phase; purchased Oct. 16, 1942; $4500.00, F.O.B. Chicago. STOKES PREFORMING PRESS, toggle type, Model "B"; motor AC 220 volts, 60 cycle, 3 phase; purchased Oct. 15, 1934; price, $2200.00, F.O.B. Chicago. FOUR-OZ. HPM INJECTION MACHINE, serial No. 22133; pressure capacity, 100 tons; line or gage pressure, 2550 lbs.; maximum ram travel, 12 in.; frame 3652; type "K"; Model 5K 365 A64; volts, 220-440; full load amps, 38.4 or 19.2; speed under full load, 1165; horsepower, 15; purchased in Oct. 1939; $450.00 F.O.B. Chicago. Box 529, Modern Plastics.

FOR SALE: Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars address Box 532, Modern Plastics.

OUTSTANDING PLASTIC MACHINERY: Royle #1 & #2 EXTRUDERS. R & P, W & P, 4, 8, 12 oz. INJECTION MOLDING MACHINES. Banbury #1A & #9 MIXERS. 6-Jacketed, sigma bladed Day, W & P, Reed 20 to 150 gal. MIXERS. Pony 15 to 40 gal. MIXERS. Thropp 3 roll 10" x 20" & Farrell Birmingham 23" x 66" CALENDERS. Late model Thropp 22" x 20" x 60", Farrell Birmingham 18" x 48" & 16" x 42", Erie 6" x 12" Lab. MILLS. BUT A FEW OF THE MANY ITEMS AVAILABLE. SEND US YOUR INQUIRIES AND SURPLUS LIST. CHEMICAL & PROCESS MACHINERY CORPORATION, 146 Grand Street, New York 13, N. Y.

SAVE WITH GUARANTEED REBUILT EQUIPMENT — HYDRAULIC PRESSES, 24"x24", 18" ram 318 tons; 24"x54", 260 ton, multiple opening; 24"x24", 16" ram, 250 tons; 24"x24", 12" ram, 170 tons; 24"x42", 2—12" rams, 340 tons; 42"x42", 16" ram, 250 tons; 36"x52", 14" ram, 325 tons; 36"x 36", 12" ram, 141 tons; 20"x18", 10" ram, 118 tons; 20"x20", 10" ram 118 tons; 19"x 24", 10" ram, 78 tons; 22"x15", 8" ram, 75 tons; 27"x21", 8" ram, 75 tons; 15"x15", 8" ram, 75 tons; 12"x12", 7½" ram, 60 tons; 12"x12", 6½" ram, 50 tons; 8"x9½", 4½" ram, 20 tons; 16"x16", 3½" ram, 12 tons; Laboratory Press 30 tons 6"x6", Mills Laboratory, M. D., THROPP 16"x40" M. D. Mill; NEW DUAL PUMPING UNITS, all sizes; Worthington Triplex 1½ gal. 2200#; 4 plunger 6 gal. 2000#; Extruders Royle Rubber & Plastic ½2 units; PREFORM MACHINES, Stokes R & T, Colton 5½T and Stokes DDS-4 with Reeves Drives, also Mixers, Calenders, Vulcanizers, Accumulators etc.

UNIVERSAL
HYDRAULIC MACHINERY COMPANY
285 Hudson St. New York City 13, N.Y.

FOR SALE: Two 2 oz. Reed-Prentice injection machines. Good condition. Reply Box 537, Modern Plastics.

FOR SALE: 80 oz. Watson Stillman Horizontal Injection Molding Machine with plasticizing units. Purchased new in 1946. (8) 530 Tons French Oil Mills Semi Automatic Molding Press. Lafayette Machinery Co., 3760 E. Lafayette, Phone Lo. 7-7745, Detroit 7, Mich.

FOR SALE—Camachine 9-A—complete with 7½ H.P. variable speed Reliance Drive. New condition. Meadows 72" Hydraulic embossing machine complete with drive. Some engraved embossing rolls included. Purchased new 1947. Reply Box 551, Modern Plastics.

Two French Oil hydraulic presses for sale. 54" x 54" platen, steam heated. Four 21" diameter rams on each press at 2000 pounds per square inch pressure for a total of 1500 tons. Complete with automatic pull through for coated fabric embossing. 7 inch daylight. Reply Box 552, Modern Plastics.

FOR SALE AT REDUCED PRICES
Stokes Eureka, RD3 & DDS2; Colton 3RP Rotary Tablet Machines.
Mikro Bantam, 1 SH, 2TH & 4TH Pulverizers; Jay Bee, U1 & 3AT, Schutz-O'Neill, Stedman, Rietz Mills.
Baker Perkins & Readco Heavy Duty 100-150 gal D.A. Jacketed Mixers.
J.H. Day 75 & 35 gal. Imperial, D.A. Jacketed, Sigma Blade Mixers.
Hobart & Read Vertical Mixers.
Day & Robinson 100, 600, 1000, 1200, & 4000 lbs. Dry Powder Mixers.
J.H. Day #31 Ro-Ball Sifter.
Package Machy. FA, FA30; Miller & Scandia Cellophane Wrappers.
Tell Us Your Requirements
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EQUIPMENT CO.
318-322 Lafayette Street
New York 12, N. Y.

Machinery and Equipment WANTED

New manufacturer wants injection molding machines, also extruding equipment. Will pay good prices. Reply Box 556, Modern Plastics.

WANTED: Complete plants, also individual items such as: Mixers, grinders, 2-roll mills, extruders, etc. Reply Box 525, Modern Plastics.

WANTED: Used Reed Prentice 8 oz. plastic moulding machine. Will pay cash.—Neo Products Co., 2534 S. Kedzie Ave., Chicago 22, Illinois.

WANTED
IMPCO INJECTION
MOLDING MACHINES
Reply Box 550, MODERN PLASTICS

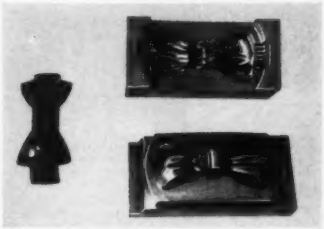
WANTED: 1 250 ton Hot Platen Hydraulic Press Minimum opening 24" Platen size 50" x 100" with or without platens. Western Products, Newark, Ohio.

WANTED: Late Models 4, 9 and 16-ounce HPM or Watson Stillman Injection Molding Machines. Must be seen running. Reply Box 543, Modern Plastics.

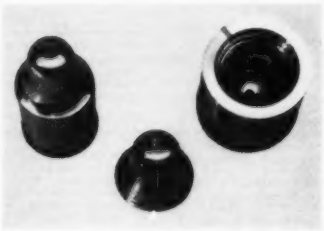
We have a problem in the hand cleaning and washing of large molded polystyrene pieces, approx. 12" x 12". We are interested in an efficient and automatic cleaning device or method to replace the hand operation. If you have a solution to our problem please contact us through Box 553, Modern Plastics, for further details.

(Continued on p. 174)

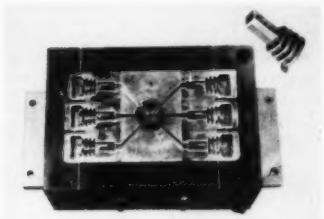
On Job, After Job, After Job...



Mold for decorative consumer item. SAMSON EXTRA supplied excellent hobbing for sharp detail on cavities and force plugs.



6-cavity mold for ladies' cosmetic container. Perfect finishes on over 1 million parts to date with SAMSON EXTRA.



Mold for television tube support. SAMSON EXTRA provided uniform response to heat treatment, excellent hobbing and high strength.

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Plant: 67 North 9th Street • Brooklyn 11, N. Y.
Phone: MAin 5-7450 • *Cable:* Chemprod Brooklyn

CLASSIFIED ADVERTISING

(*Continued from p. 172*)

Materials Wanted

WANTED: Ethyl Cellulose reground scrap, any color and quantity. Send Samples offered. Reply Box 526, Modern Plastics.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene. Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 5-7943.

WANTED: PLASTIC Scrap or Rejects in any form. Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 527, Modern Plastics.

"We buy "Old UREA" molding compound or odd colors
Box 143, Arverne, New York

WANTED: Uncured scrap. Canvas fabric eight to thirteen ounce with 40 to 50% phenolic resin impregnate and volatile content between 5 and 7%. Job lots or production quantities. Purchasing Department, American Brake Shoe Company, American Brakeblok Division, 4600 Merritt Ave., Detroit 9, Michigan.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic and Ethyl Cellulose. Reply Box 536, Modern Plastics.

Canadian manufacturer requires from five hundred to one thousand pounds of clear rigid vinyl sheet scraps per month. Prefer to purchase from fabricator. Reply Box 555, Modern Plastics.

Molds Wanted

WANTED: Canadian agent seeks to buy outright or lease on a royalty basis American molds, any type, toys, kitchen utensils, electrical appliances, hardware, radio cabinets, new devices, etc. Please send full details, costs, and samples. Reply Box 528, Modern Plastics.

INJECTION MOLDS WANTED: By reputable company located in the East. We will purchase or rent molds for toys, clothes hangers, housewares, novelties, packaging containers, etc. Reply with samples and complete information to Box 546, Modern Plastics.

Help Wanted

WANTED—CHEMICAL ENGINEER As INSTRUCTOR in high polymer chemistry for Engineering College in Chicago Area. Should have teaching and research experience with a wide background in synthetic resins. Permanent position having good environment and excellent facilities. Desirable living quarters in new conventional housing available. Outline in complete detail experience, research activities, accomplishments, and educational degrees. Write fully regarding family status and salary requirements. Salary is flexible to meet ability and record of applicant selected. Congenial faculty knows of this opening. Replies will receive full confidence. Box 547, Modern Plastics.

PLASTICS CHEMIST: Experienced in vinyl formulating and compounding, for research and development laboratory of Connecticut manufacturer of electrical insulating materials. Good opportunity. Only those with required experience will be considered. Reply Box 537, Modern Plastics.

WANTED: Research Director thoroughly acquainted with all phases of vinyl plastics such as casting, calendering and extrusion; also should know printing inks and processes, and should be well acquainted with the entire field. An outstanding opportunity for a top man with one of the leading manufacturers. Reply Box 531, Modern Plastics.

WANTED Research Chemist: Experienced in Phenolic, Urea and similar resins wanted for Midwestern plant. Write fully regarding education, experience and salary expected. Reply Box 533, Modern Plastics

PLASTIC ENGINEER: General Thermoplastic experience sales and estimating. This opening with an old successful plastics fabricator and molder in New Jersey. Reply Box No. 534, Modern Plastics.

VINYL RESINS
Sales Representative—Needed with Chemical engineering degree or B S in Chemistry plus five years experience or more in compounding or production or sales of vinyl resins. Positions available due to expansion; salary, expenses, and car furnished. Submit personal data and salary expected by letter to CW Meager, Sales Personnel Department, Goodyear Tire and Rubber Company, Akron, Ohio.

PLASTIC PRESS SUPERVISOR
To supervise battery of 50 compression presses and 4 injection presses. Must have thorough knowledge of plastic technique and be production minded. Excellent future in growing concern. State salary expected and past experience. Located middle west. Box 539, Modern Plastics.

Young Man Wanted—Willing to work in sales—Northern Part of Florida, with general knowledge of Plastics. State age, experience and salary. All replies will be kept confidential. Reply Box 545, Modern Plastics.

PLASTICIZER SALES SPECIALIST: Want a producer with excellent chemical knowledge and sound commercial experience, preferably in vinyl plasticizer or related synthetic elastomer industries. Must be candidate for further sales management growth. Will have direct contact with customers and work for management headquarters. Please give full details of education, past experience, nature of present work, current salary and reasons for changing. Reply Box 544, Modern Plastics.

Situations Wanted

POLYETHYLENE FILM EXTRUSION EXPERT. Married man, 43 years old. Can design dies and auxiliary equipment, pullers and winders. Can take complete charge of production. Able to plan, organize and set up complete shop. All replies will be kept confidential. Reply Box 538, Modern Plastics.

Commission Salesman 28, dynamic, sell anything anywhere. Desire return and work USA about August for Molder or Plastics distributor of toys, houseware, novelty, premium items. Can work international sales or European representation if desired. 3 yrs. Mech. Eng. U. of Wis., 3 yrs. pilot U.S. Air Force, 3 yrs. selling and contracting to U.S. Army and sale of surplus throughout Europe. Reply W. N. Kealey, 93 rue Emile Banning, Brussels, Belgium.

SALES AND ADMINISTRATION: Seven years experience selling injection and compression custom molding to leading industrial buyers of plastic parts. Can estimate costs, aid in product design, recommend materials, and give sensible on-the-spot answers to prospective customers. Age 35, university education, own car, willing to travel part time. Also experienced in purchasing, production control, and office management. Presently handling sales and administrative work for medium-size molding company. Current salary $6600 per month. Reply Box 535, Modern Plastics.

INJECTION MOLDING FOREMAN CAPABLE OF TAKING FULL CHARGE SMALL PLANT OR DEPARTMENT. LONG EXPERIENCE REED-PRENTICE. EXCELLENT TROUBLE SHOOTER. PRODUCTION, MAINTENANCE AND MOLDING OPERATIONS. REPLY BOX 554, MODERN PLASTICS.

Miscellaneous

REPRESENTATIVES WANTED: Exclusive territory to experienced men. Commission basis. Custom molding of thermosetting plastics. Van Norman Molding Co., 4631 Cottage Grove Ave., Chicago 15, Ill.

MOLDS AVAILABLE: Complete line of staple injection molding dies. No novelties. Plant owner discontinuing plastic division. Guaranteed to give added volume to any plastic molder. Reply Box 550, Modern Plastics.

FOR SALE: Big quantities Saran filament scrap (vinyl chloridecinylidene chloride) mixed colors. Reply Box 542, Modern Plastics.

INVENTION OF NEW PLASTIC ARTICLE For use of musical instrument. Patent Pen. Now available for royalty sales arrangements. Addr. Edward Netzger 5136 Stafford Rd., Baltimore, Md. 29.

INCREASE YOUR VOLUME of business with fresh new ideas, well designed proprietary products and an outstanding product design and packaging service to your customers. Executive with 15 years Industrial Design and manufacturing background in plastics, toys, housewares, giftwares, appliances, etc. Can do this for you. Let me tell you how. Reply Box 540, Modern Plastics.

"Medium-sized Chemical Factory in Hamburg, Germany, well equipped, financially sound desires contact with American producer of chemical accessories for the paint-, lacquer-, rubber- or textile industry. Basis collaboration or production under a license agreement. Please write Circle 1739, Annoncen—Julius, Hamburg 1, Monckebergstr. 13, Germany."

FOR SALE
Modern well designed injection molding plant with small mold shop. Conveniently located in the Metropolitan New York area. Line consists of Housewares, Toys and Novelties. Ready and good going business with factory equipment and propriety molds in excellent condition. Additional battery of machines can be installed in plant consisting of 28,000 square feet. In good labor market. Low rental. Reply Box 784-M, 217-7th Ave, New York 11, N. Y.

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For further information address Classified Advertising Department, Modern Plastics, 122 E. 42nd St., N. Y. 17, N.Y.

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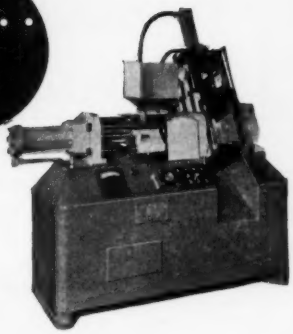

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- The Moslo Duplimatic Minijector.
- The Moslo No. 60 Plastic Granulator.

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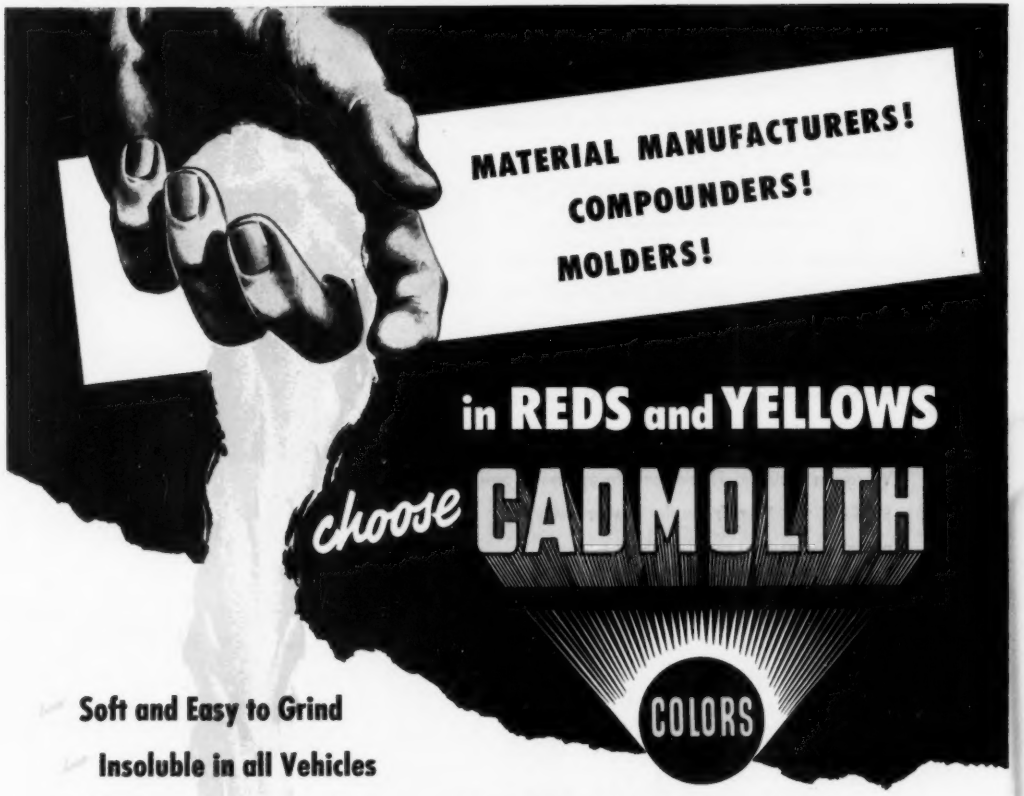

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for Plastic Materials

Glidden leadership in pigment research has produced in Cadmolith* Colors the very finest reds and yellows available anywhere—measured by every standard of importance to material manufacturers, compounders of new and old materials and plastic molders and coaters. Where a higher degree of opacity is required, *Pure* Cadmium Reds are available in the same broad range of shades as our Cadmolith* Reds.

Send for Folder giving complete details, with color chips. Write The Glidden Company, Chemical and Pigment Company Division, Union Commerce Bldg., Cleveland 14, Ohio.

QUALITY Glidden PRODUCTS

THE GLIDDEN COMPANY
CHEMICAL & PIGMENT COMPANY DIVISION
Baltimore, Maryland • Collinsville, Illinois • Oakland, California

*Trade Mark Registered

SUNOLITH*	ASTROLITH*	ZOPAQUE*	TITANOLITH*
Lithopone	Lithopone	Titanium Dioxide	Titanated Lithopone

DOES your product need a "boost" in sales? Bring it to Worcester Moulded Plastics for a plastic revamping. From the "ground floor" planning to the completion of your product, our complete custom injection moulding service will be with you every step of the way. We neither manufacture nor market any product of our own. Your product comes first with our experienced engineers, die designers, die makers, moulders, finishers and inspectors. As the largest custom injection moulders in the East, we can guarantee the volume you need when you need it.

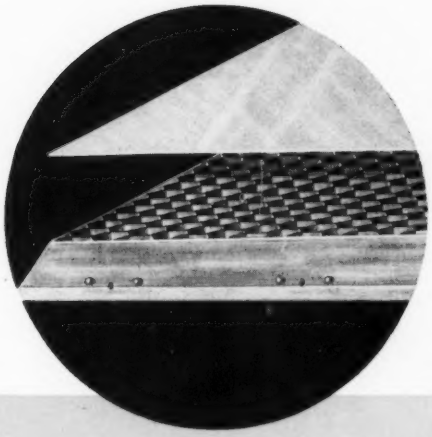
Worcester Moulded Plastics' service applies to new products, too. If you're in the new product planning stage, let us in on the "ground floor".

Custom Injection Moulding

WORCESTER MOULDED PLASTICS CO.

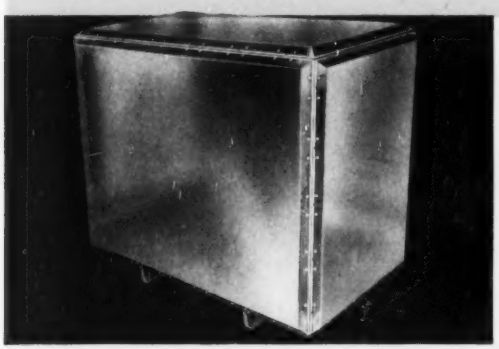
14 HYGEIA STREET, WORCESTER 8, MASS.

17 East 42nd St., New York 17, N. Y.

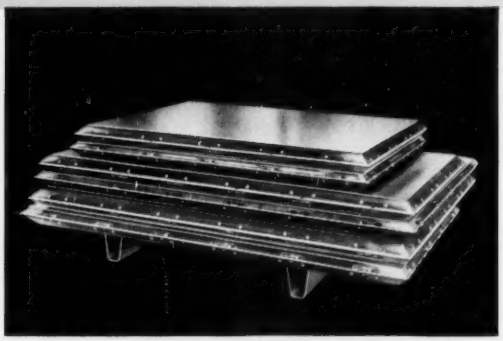


Honeycomb core is formed of BAKELITE resin-impregnated material. Core is permanently bonded to facings with BAKELITE resin adhesives to form a rigid, lightweight, high-strength panel.

New honeycomb laminates knock down shipping costs!



Special fasteners make it possible to assemble panels into pressure-tight, moisture-tight, easily cleaned shipping boxes in sizes up to ½ carload capacity.



After delivery, boxes can be knocked down in a matter of minutes to reduce bulk . . . save shipping space and costs. This complete box weighs only 150 pounds, has 30 cubic feet carrying capacity.

Want a shipping container that reduces costs because it is easily taken apart for return shipment in the flat—and can be used over and over again? That's your cue to look into the new honeycomb laminated boxes developed by U. S. Plywood Corporation and made possible by BAKELITE Phenolic Plastics.

This unique engineering achievement provides lightweight, high strength panels that are easily assembled into knock-down boxes that greatly reduce shipping weight—and costs. Moreover, these boxes offer high compressive and bending strength...good thermal insulating properties . . . a very low water vapor transmission and high resistance to decay.

BAKELITE Resins and Adhesives are used throughout. The honeycomb core material is formed of special paper stock or cotton sheeting impregnated with BAKELITE Phenolic Resin. The treated core stock is then cured to desired rigidity after which it is bonded to the aluminum facings with resin-base adhesives.

Honeycomb laminates may have a place in your plans for more efficient distribution. Discover how they can be put to work for you. Write Dept. AK-13.

Data courtesy of U. S. Plywood Corporation, 55 W. 44th St., New York 18, N. Y.

Bakelite TRADE-MARK Phenolic LAMINATING PLASTICS

BAKELITE DIVISION UCC

BAKELITE DIVISION, *Union Carbide and Carbon Corporation*, 30 East 42nd Street, New York 17, N. Y.

Announces 3 new

HYCAR*-PHENOLIC

COMPOUNDS

Choose from this complete family of new G-E Hycar-phenolic compounds! Each has the properties inherent in its filler, plus outstanding shock-resistance and resilience contributed by the Hycar rubber component. These G-E Hycar-phenolic compounds were designed to help you get new and profitable business by opening new markets to plastics materials, and by assisting your customers to make better products. They mark the latest contribution in General Electric's continuing program aimed at providing new and better materials for industry—the new materials that will lead to the new and improved products of tomorrow.

*Hycar American rubber; registered trade name, B. F. Goodrich Chemical Co.

1 ASBESTOS FILLED. Parts molded from this compound have the characteristic heat resistance of mineral-filled phenolics but possess improved shock resistance. The molding powder has low bulk factor, good pourability and molded parts possess low water absorption. This compound offers new design possibilities where heat and shock resistance is required.

2 FLOCK FILLED. For applications requiring greater strength and shock resistance than wood flour-filled Hycar-phenolic compounds as well as good moldability, G-E 12808 offers distinct advantages.

3 FABRIC FILLED. Rugged heavy duty parts molded from this compound stand up under severe mechanical abuse and open up many applications where plastics could heretofore not be used. Tests show that molded parts possess over 5 times the shock resistance of regular fabric-filled phenolics.

These three plus the recently introduced wood flour-filled compound round out the G-E Hycar-phenolic family. The outstanding abuse resistance of the wood flour-filled compound offers molders new opportunities for lower cost molding of impact and shock resistant parts through the use of automatic preforming equipment, rapid molding cycles, and inexpensive cleaning methods.

FIND OUT MORE about this remarkable family of compounds. Send for experimental samples today, and make your own evaluations. Or write for detailed data sheets. We welcome the opportunity to work with you—to give you the materials you need to improve your product. Address Section 38-1, Chemical Department, General Electric Company, Pittsfield, Mass.

You can put your confidence in—

GENERAL ELECTRIC

CD49-S8